SUB COPY

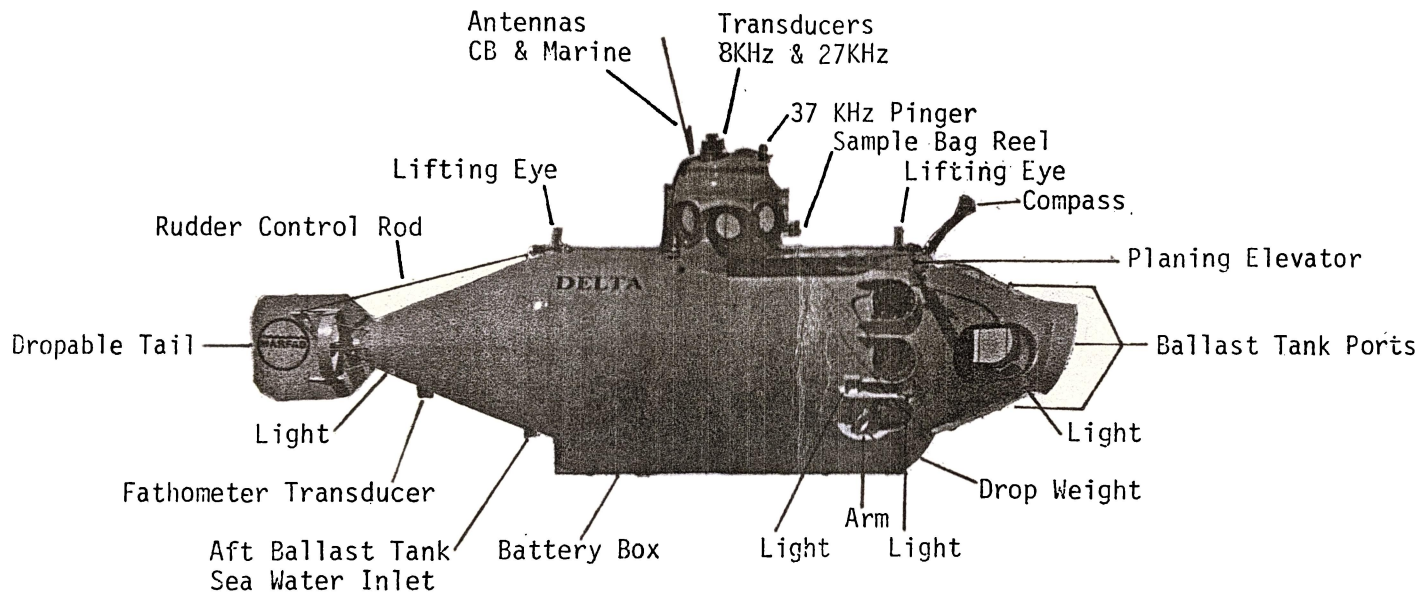
DELTA

OPERATION MANUAL

MARFAB
1428 E. Borchard Ave.
Santa Ana, Ca. 92705

NEKTON
SCRIPPS OCEANOGRAPHICS

EXTERIOR VIEW



DELTA

PRE-LAUNCH CHECKLIST

1. OXYGEN -- The oxygen bottle must have at least 500 psi. The emergency supply must be full (2250 psi each).

2. AIR -- One air bottle must contain at least 800 psi. The other must be full (2250 psi).

3. TRIM -- Check the combined weight of the observer, pilot and extra equipment of the previous dive versus the combined weight of the upcoming dive. If the combined weight total differs, add or remove lead trim weights so DELTA and the occupants remain approximately fifteen (15) pounds negatively buoyant. The trim weights are stored under the deck plates inside DELTA.

4. SODASORB -- After ten (10) hours of diving or at the beginning of each day the sodasorb should be changed. Four quarts of sodasorb are required to fill the cannister. The cannister is to be removed from DELTA for filling.

5. OTHER EQUIPMENT -- Make certain all valves are closed. Make sure the bow plane and sample bag are attached to DELTA. Check that the following items are in the submersible:

Diving Regulator	Tools
Flashlight	Operation Manual
Cyalume Sticks (6)	

6. An inexperienced observer must be briefed on operation of the submersible, especially with respect to emergency equipment and procedures.

INSTRUCTIONS FOR SURFACE CREW DURING DIVE

1. Put underwater communications transducer in the water.

2. Check surface radio communications before the sub dives.

3. Check underwater communications as soon as the sub is submerged.

4. Check sub pinger with the directional tracker as soon as the sub is submerged.

5. Maintain dive log and dive report.

6. Make communications check with the sub at intervals of fifteen (15) minutes maximum. Ask for oxygen check every thirty (30) minutes.

7. Record times of transmissions and details of important communications in dive report.

8. Make sure area is free from traffic and support vessel is clear of surface point before allowing sub to surface.
   CAUTION -- Maintain watch for high speed vessels coming into area during ascent.
   CAUTION -- Do not lose contact with submersible by allowing submersible to get out of voice and/or pinger range.

PILOT'S CHECKLIST

Use the word "HABIT" to check submersible before diving.

H -- Hatch, Check seating surface for foreign material; then close and lock hatch. NEVER CLOSE HATCH WITHOUT LOCKING.

A -- Air, Check pressure in air tanks.

B -- Breathing System, Check pressure in oxygen tanks; check that oxygen valve is open; regulate oxygen flow; check sodasorb cannister and that blower is on; turn on and check 02 sensor.

I -- Instruments, Turn on master breakers; set altimeter; set gyro; turn on other switches as required; outside lights off.

T -- Trim, Make sure trim has been adjusted for the dive.

IMPORTANT PROCEDURES FOR THE DELTA SUBMERSIBLE

1) If low visibility prevents the pilot from seeing the bottom from the conning when sub is sitting on the bottom proceed with extreme caution.

2) Do not use outside lights unnecessarily.

3) Turn off all outside lights upon surfacing.

4) Pilot must request and receive clearance from support vessel before surfacing (except in extreme emergency).

5) SCUBA diver and SCUBA gear must be aboard the support vessel during all dives.

TOOL BOX INVENTORY

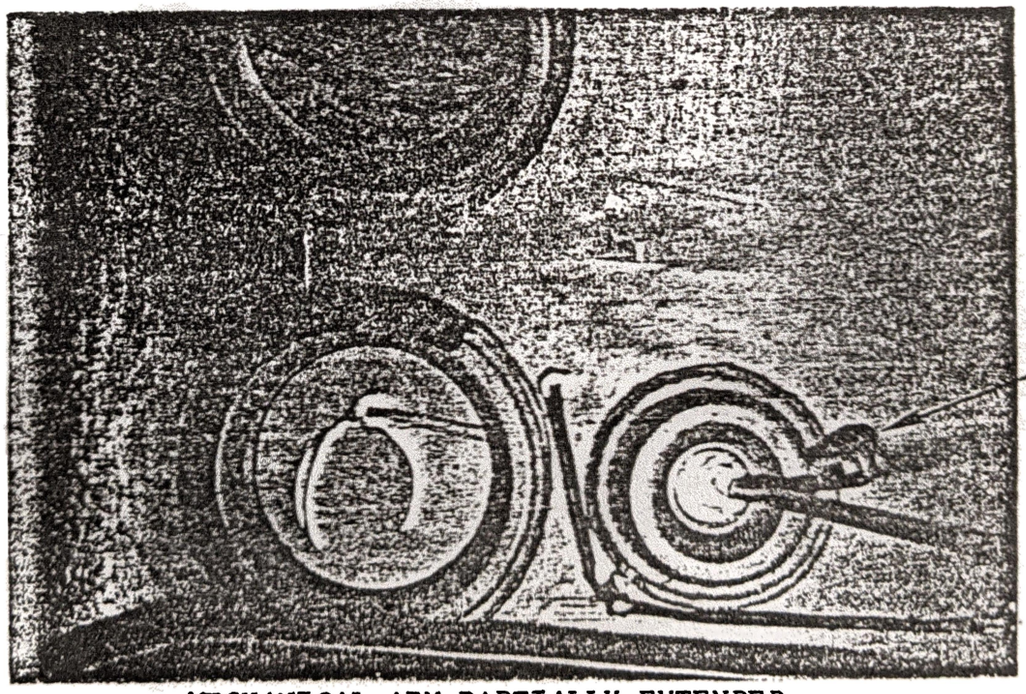
1 12 inch crescent wrench
1 - pair of vice-grip pliers
1 - set of allen wrenches
1 - pair of pliers
3 - standard screwdrivers: small, medium, and large
1 - ratchet and extension
2 - sockets 3/4, 5/8
1 - set combination wrenches 7/16, 1/2, and 9/16
1 - fog horn

SPARE PARTS

Fuses
Rags
Grease
Operation manual

MECHANICAL ARM

The mechanical arm is used to pick up objects from the ocean bottom. The best position for the observer to assume to operate the arm is to lie on his left side. He extends the arm out as far as necessary with his face next to the lower port on the starboard side. The observer directs the pilot in maneuvering the sub or he can move the sub slightly himself with the arm. When the observer has an object firmly grasped with the arm, the pilot lowers the sample bag to the bottom by turning the small crank in the conning tower. When the bag touches bottom, it automatically opens and the observer drops the object into the bag. When the arm is retracted and clear of the bag, the pilot raises the bag to its stowed position and secures the crank handle with its retaining band.



MECHANICAL ARM PARTIALLY EXTENDED

CAUTION: NEVER RELEASE THE ARM WHILE IT IS EXTENDED AS EXTERNAL PRESSURE WILL CAUSE IT TO SNAP BACK INTO THE SUB, POSSIBLY RESULTING IN DAMAGE OR INJURY.

CAUTION: IF THE ARM IS USED BELOW 500 FEET, THE PILOT IS TO ASSIST THE OBSERVER BY HOLDING TENSION ON THE ASSIST LINE CONNECTED TO THE ARM.

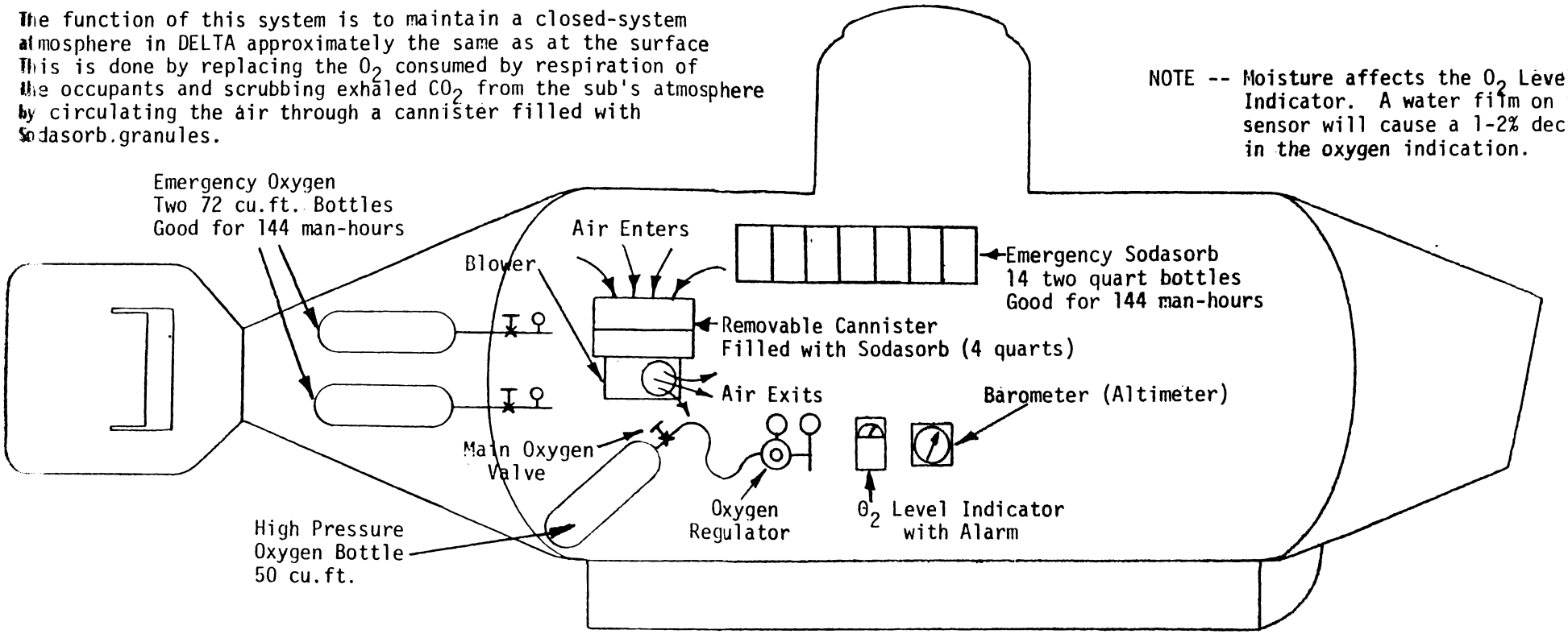
CAUTION:. DO NOT USE EXCESSIVE LATERAL OR PRYING FORCE ON THE ARM OR IT MAY BE DAMAGED.

CAUTION: ALWAYS STOW THE ARM IN ITS FULLY-RETRACTED POSITION WITH THE HANDLES UP WHEN IT IS NOT BEING USED.

LIFE SUPPORT SYSTEM

The function of this system is to maintain a closed-system atmosphere in DELTA approximately the same as at the surface This is done by replacing the O_2 consumed by respiration of the occupants and scrubbing exhaled CO_2 from the sub's atmosphere by circulating the air through a cannister filled with Sodasorb granules.

NOTE -- Moisture affects the O_2 Level Indicator. A water film on the sensor will cause a 1-2% decrease in the oxygen indication.



SODASORB

Sodasorb granules are used as the CO_2 in DELTA. Four quarts of Sodasorb are required to fill the cannister. Fresh Sodasorb is white; it turns purple when saturated with CO_2. The Sodasorb should be changed when approximately ten hours of diving is done. Fourteen bottles of emergency Sodasorb are stowed on the port and starbord sides aft of the pilot seat.

CAUTION -- DO NOT OPERATE THE BLOWER WITHOUT SUFFICIENT OXYGEN FLOW

OXYGEN

The oxygen bottle is located above the starboard high pressure air bottle aft of the pilot. Two emergency 72 cu.ft. oxygen bottles are located in the aft ballast tank.

TO OPERATE THE SYSTEM:

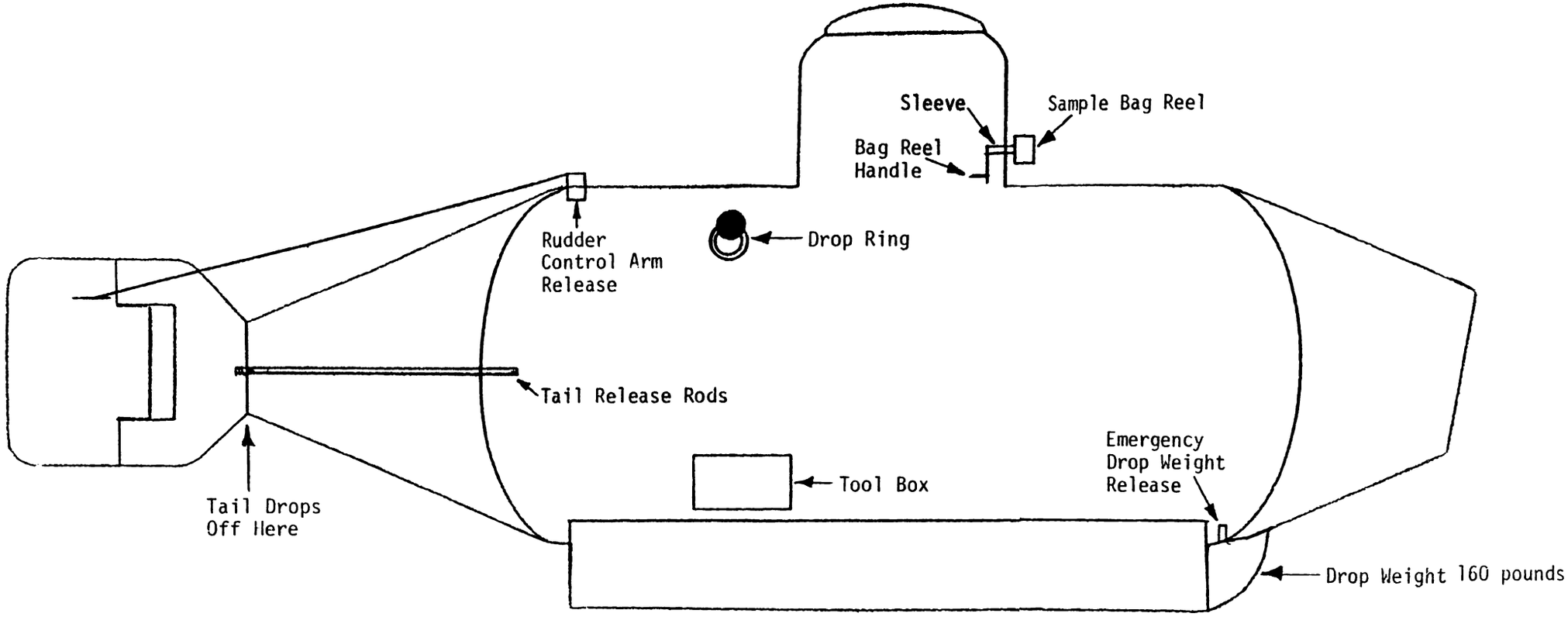
1) Turn main oxygen valve on
2) Set oxygen flow rate with regulator valve to approximately "2" on the gauge. (Proper setting depends on the activity level of the occupants) ALWAYS MAINTAIN OXYGEN FLOW
3) Monitor O_2 Level Indicator and adjust flow to maintain a 20.8% reading.

BAROMETER (ALTIMETER)

The barometer measures atmospheric pressure inside the sub and is used as a guide for controlling the O_2 flow. SET THE ALTIMETER AT SEA LEVEL BEFORE CLOSING THE HATCH. If the altimeter shows an increase in altitude, increase the O_2 flow. If there is a decrease in altitude decrease the O_2 flow. NOTE Temperature variations may cause changes (approx. 300') in altitude readings.

NOTE- High pressure air leaks will cause a large decrease in altitude.

EMERGENCY WEIGHT RELEASES



TO JETTISON TAIL

First disconnect the rudder control arm from inside the sub using the 12" crescent wrench. Then unscrew the two tail release rods using the ratchet and socket in the tool box. Unscrew each rod alternately one turn each until the tail is jettisoned.

TO JETTISON DROP WEIGHT

Unscrew the release, located under the forward deck plate, using the ratchet, extension, and socket located in the tool box.

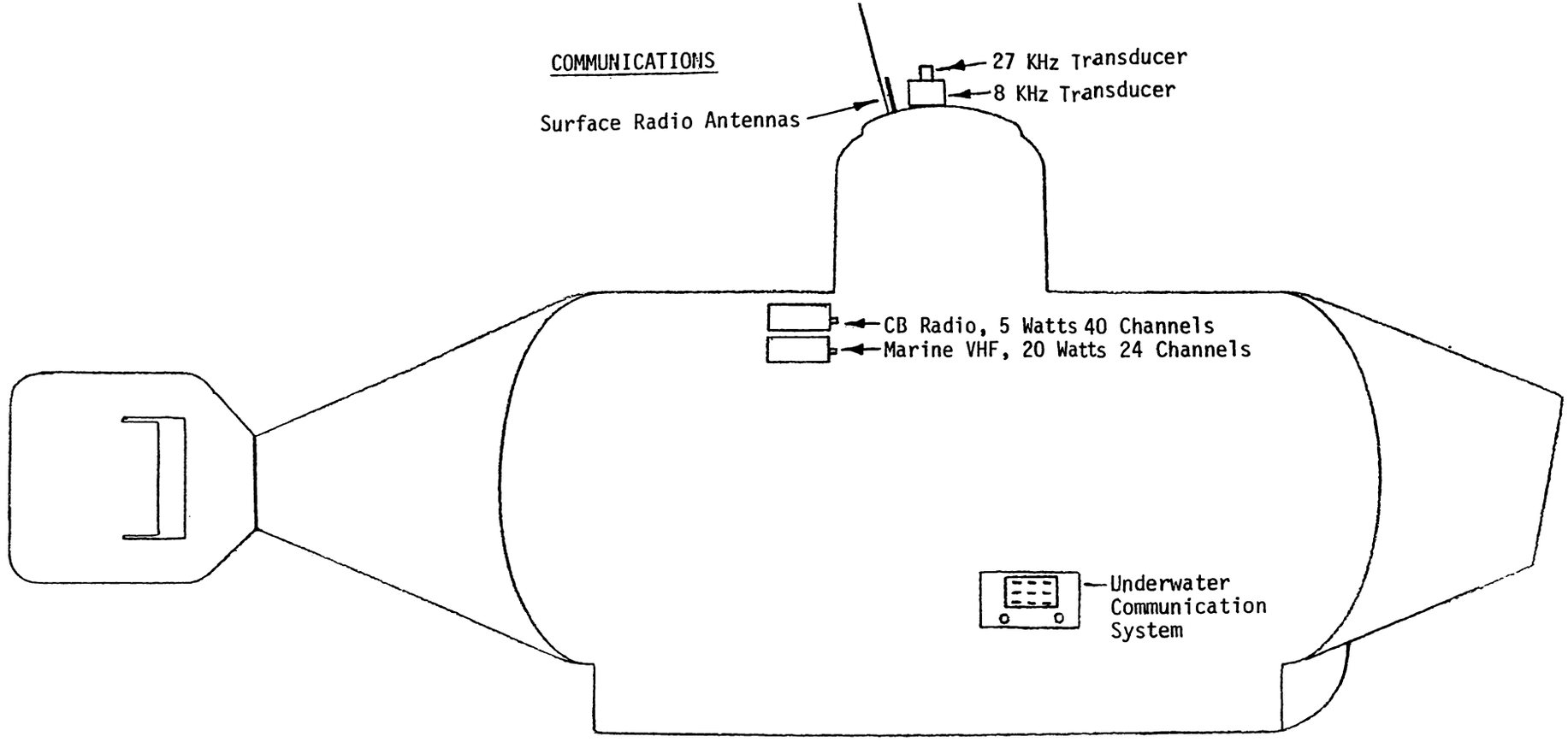
TO JETTISON DROP RING

Turn crank on starboard side aft of conning tower.

TO JETTISON SAMPLE BAG

The sample bag and its line may be released from inside DELTA, first, unreel the line, then remove the reel handle. Remove the sleeve between the handle and the hull and tap shaft with a lead ballast weight. The shaft will sever the line freeing it and the bag.

NOTE -- TO UNSCREW THREADS TURN COUNTER-CLOCKWISE



UNDERWATER COMMUNICATIONS

The underwater communication system is used to communicate with the support vessel, other subs, Navy vessels with UQC equipment and divers equipped with communication systems while submerged. The differential microphone must be touching the operator's upper lip during transmissions. For best results, turn receiver to highest setting (approx. 50% of setting) at which clear, noise free signal is received and advance audio gain to desired listening level. A long count is helpful in adjusting the unit.

SURFACE COMMUNICATIONS NOTE -- ONLY ONE UNIT IS USED AT A TIME AND IS DESIGNATED BEFORE DIVING!

MARINE BAND: LOWER UNIT

The marine band radio is used to communicate between DELTA and the support vessel while on the surface. USE THE LOW POWER SETTING WHILE TRANSMITTING.

USE CHANNEL 9

Emergency Channel "16"

CITIZENS BAND: UPPER UNIT

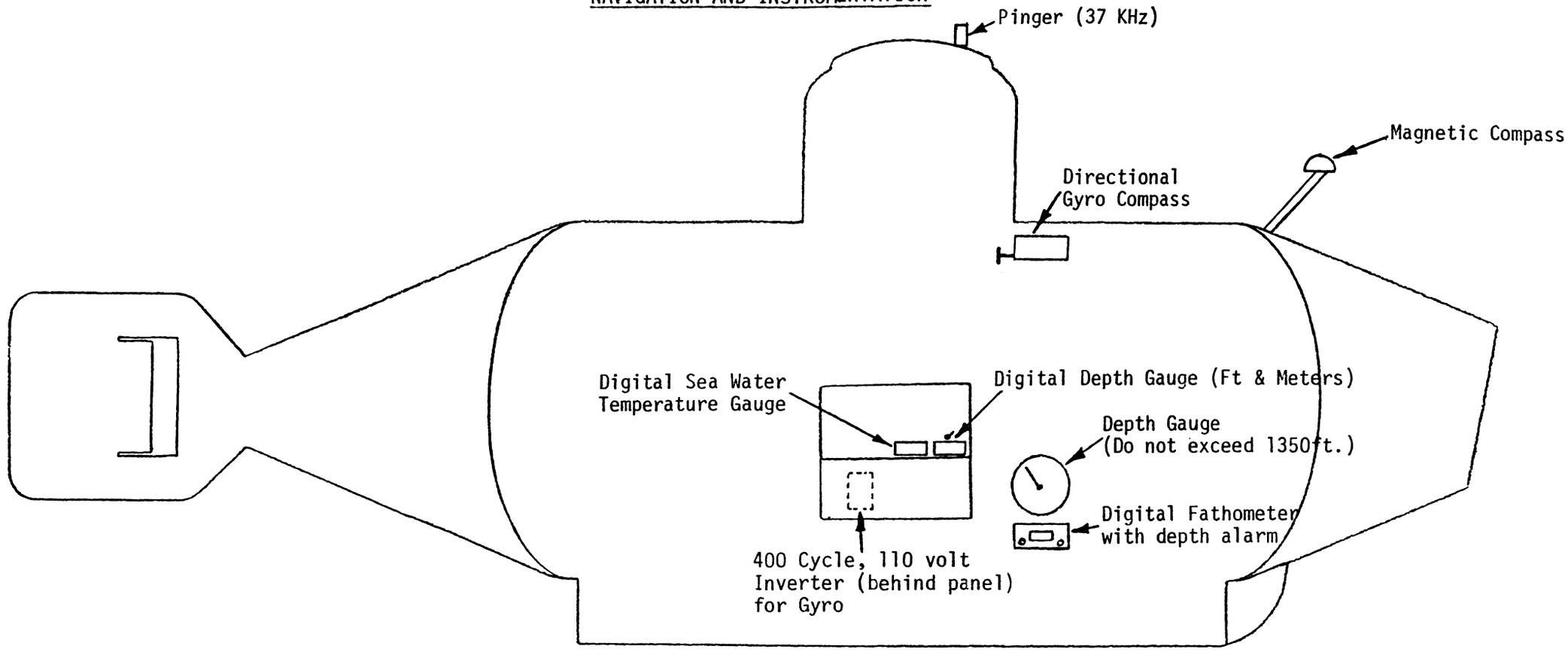
The citizens band radio is used to communicate between DELTA and the support vessel while on the surface.

USE CHANNEL 11

Emergency Channel "9"

NOTE - The CB radio serves as a backup underwater communications sysyem to a depth of 75 feet in fresh water.

NAVIGATION AND INSTRUMENTATION



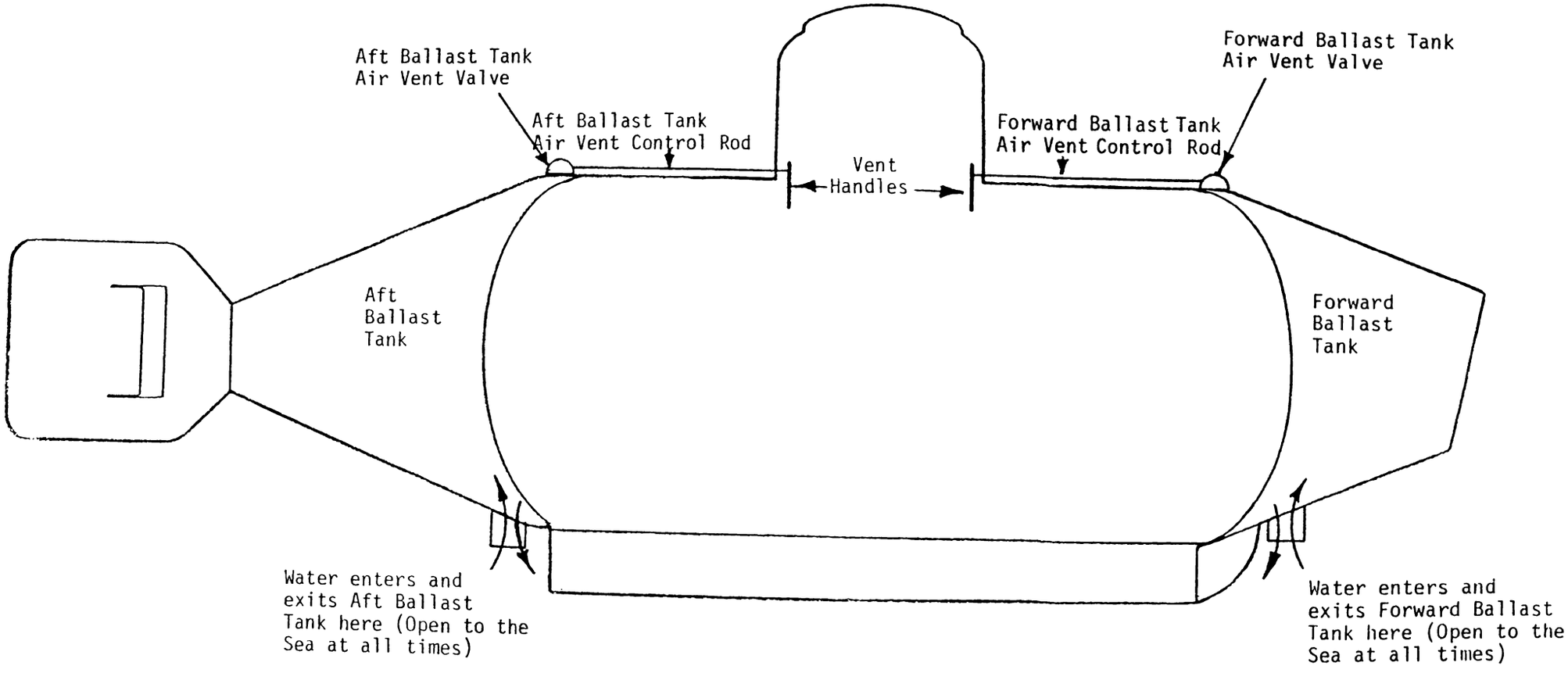
PINGER

An acoustic signal is emitted from a pinger on DELTA is used for tracking the submarine by means of a directionally sensitive receiver aboard the support vessel. The pinger is attached to the hatch and is automatically activated when submerged in salt water.
NOTE - THE FORWARD INTERIOR LIGHT SWITCH MUST BE ON FOR THE PINGER TO BE ACTIVE.

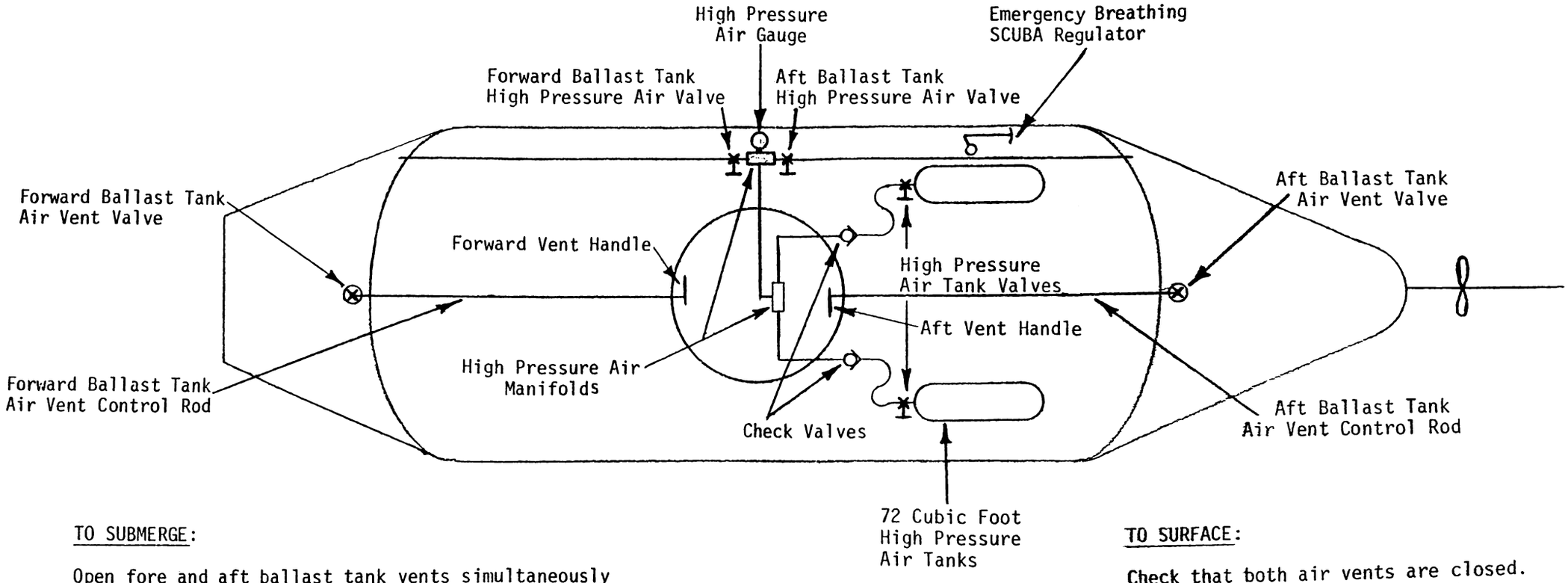
DIRECTIONAL GYRO

Turn gyro on and wait for it to come up to speed. Cage gyro and set it to match the magnetic compass heading. Use a North or South heading to set the gyro.

FORWARD AND AFT BALLAST TANK VENTS



HIGH PRESSURE AIR BALLASTING AND EMERGENCY BREATHING SYSTEMS



TO SUBMERGE:

Open fore and aft ballast tank vents simultaneously by turning both vent handles one-quarter turn to "down" position. As air is vented, water floods the ballast tanks causing DELTA to submerge. If the tanks do not flood at the same rate the bow and stern will not sink at the same rate. Proper fore and aft trim may be restored by momentarily closing the air vent valve on the lower end until a horizontal attitude is attained. CAUTION -- AFTER SUBMERGING CLOSE BOTH BALLAST TANK AIR VENTS AS SOON AS TANKS ARE FLOODED. THIS PRECAUTION PREVENTS ACCIDENTAL VENTING OF AIR TO THE SEA WHEN BLOWING TANKS FOR SURFACING.

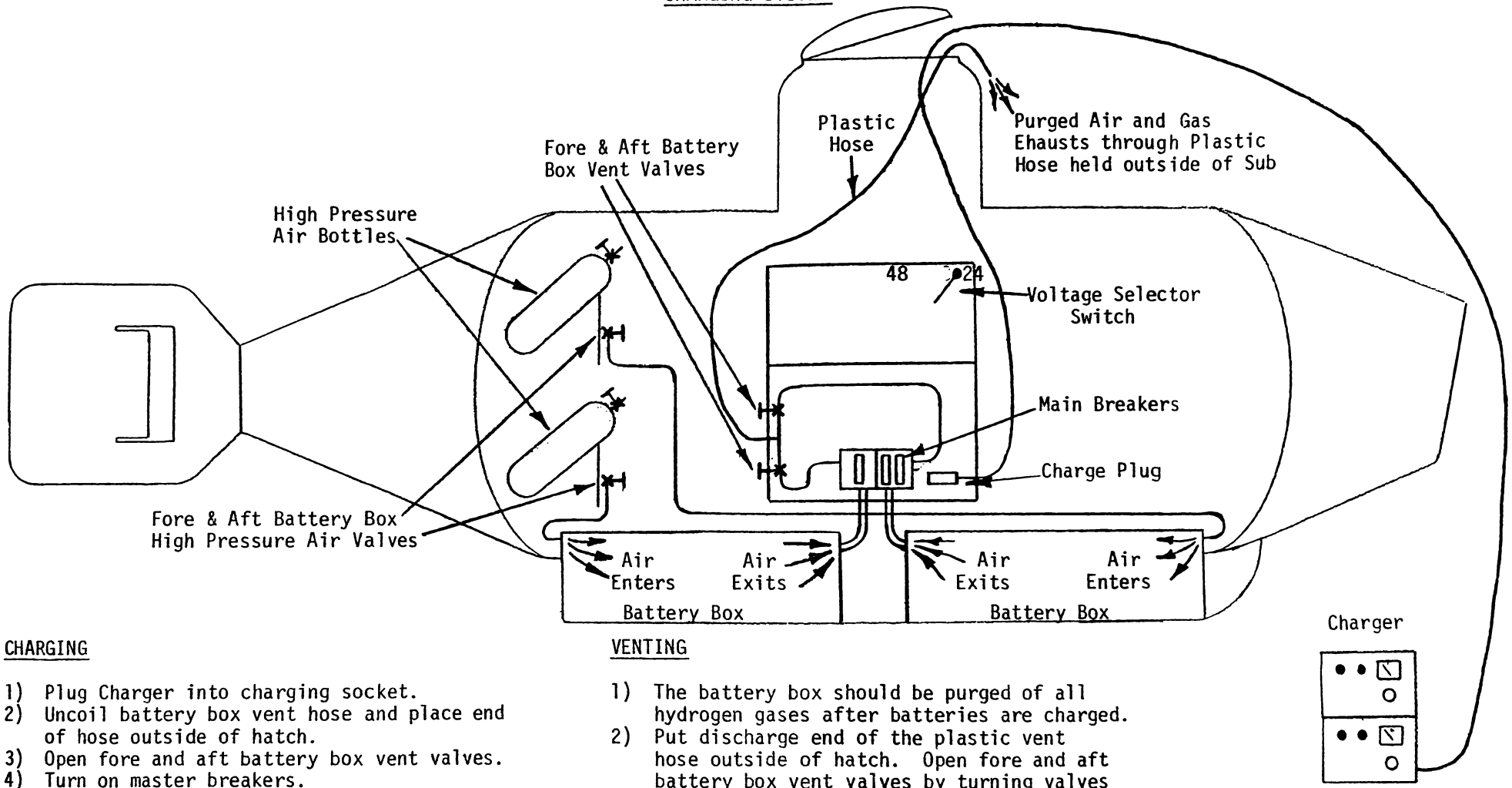
W A R N I N G

DO NOT DIVE DELTA WITHOUT AT LEAST 800 PSI IN ONE TANK AND THE OTHER FULL (2250 PSI). IF THE DIVE IS TO EXCEED 500 FEET BOTH TANKS MUST BE FULL.

TO SURFACE:

Check that both air vents are closed. Simultaneously open fore and aft ballast tank high pressure air valves slightly. This causes air to displace water in the ballast tank resulting in an increase in buoyancy. As soon as DELTA begins to rise close both air valves. Blow all ballast water from both ballast tanks upon reaching the surface. Watch water level through the front ports. NOTE -- BLOWING ALL WATER FROM THE BALLAST TANKS WILL REDUCE THE PRESSURE IN THE HIGH PRESSURE AIR TANKS BY APPROXIMATELY 500 PSI

CHARGING SYSTEM

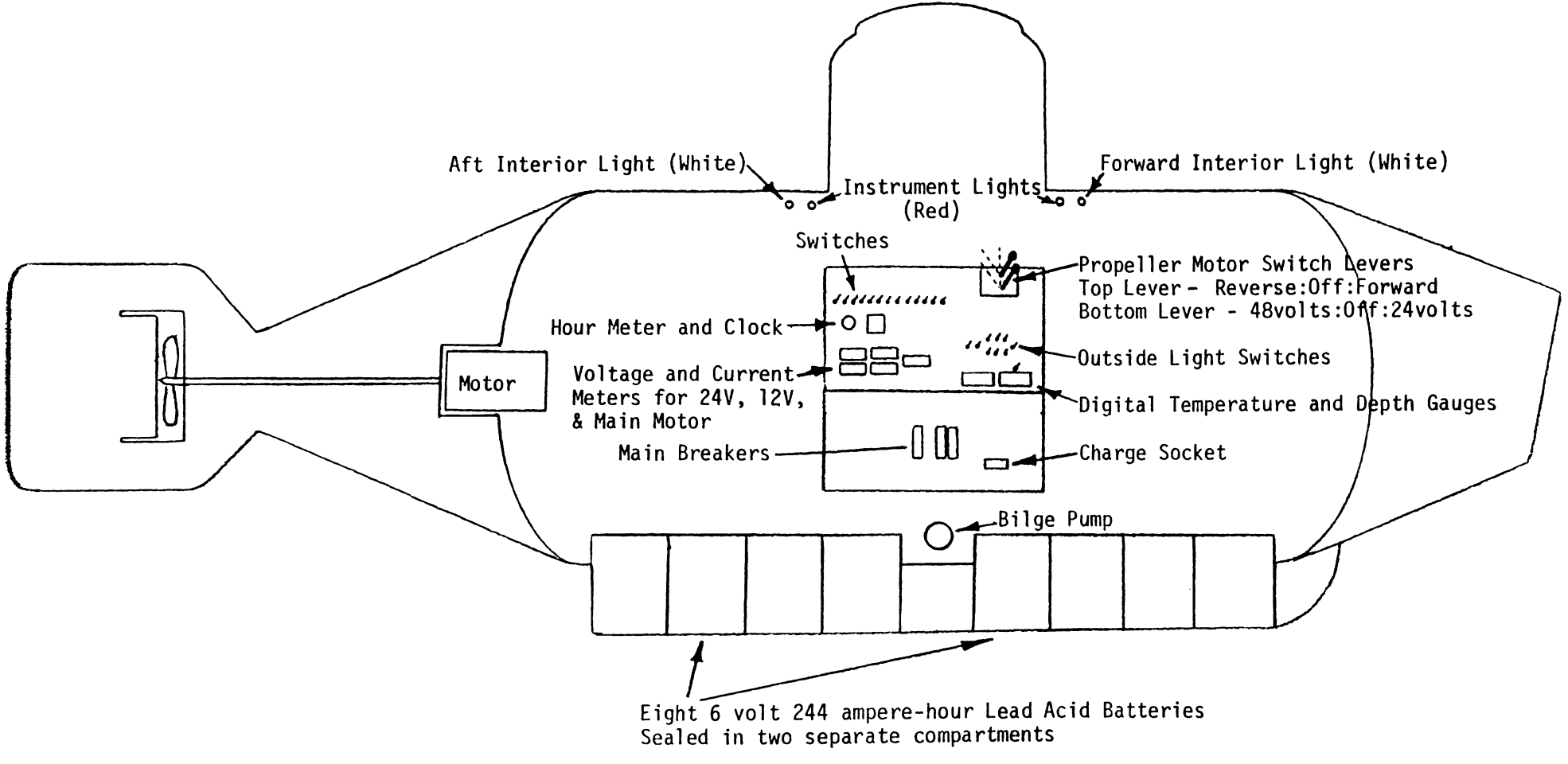


CHARGING

1) Plug Charger into charging socket.
2) Uncoil battery box vent hose and place end of hose outside of hatch.
3) Open fore and aft battery box vent valves.
4) Turn on master breakers.
5) Place motor voltage selector switch in the 24 volt position.
6) Set charger for charging. Time depends on state of discharge of the batteries. See Charger panel for details. NOTE -- When Charging fully discharged batteries it may be necessary to charge with only one charger to prevent a circuit breaker trip. After 30 min. of charging use both chargers.
7) Vent battery box

VENTING

1) The battery box should be purged of all hydrogen gases after batteries are charged.
2) Put discharge end of the plastic vent hose outside of hatch. Open fore and aft battery box vent valves by turning valves to the verticle position.
3) Force fresh air into battery box by opening the fore and aft battery box high pressure air valves. ONLY SHORT INTERMITTANT BLASTS OF AIR SHOULD BE USED TO PURGE THE BATTERY BOX. All fumes should be removed in approx. 30 seconds.
4) Turn off high pressure air valves and vent valves. Coil plastic hose.


Aft Interior Light (White)
Instrument Lights (Red)
Forward Interior Light (White)
Switches
Propeller Motor Switch Levers
Top Lever - Reverse:Off:Forward
Bottom Lever - 48volts:Off:24volts
Hour Meter and Clock
Outside Light Switches
Motor
Voltage and Current Meters for 24V, 12V, & Main Motor
Digital Temperature and Depth Gauges
Main Breakers
Charge Socket
Bilge Pump
Eight 6 volt 244 ampere-hour Lead Acid Batteries
Sealed in two separate compartments

DELTA O-RING INDEX

AS		
~~110~~	110	SMALL REEL ①
012	—	DEPTH GAUGE SENSOR ①
014	—	SCUBA BOTTLES ⑥
		ANTENNA ②
015	—	HUMMEL SONAR PENETRATOR ①
141*	—	KVH COMPASS ①
110	—	VENT RODS ②
112		CLAW ①
111	—	RUDDER ARM DROP OFF ①
112	—	DROP OFF RING ①
		LARGE REEL ①
		BALL (INSIDE) ①
114	—	BOW PLANE ①
		LIGHTS (INSIDE) ①
122	—	TRACKPOINT TRANSPONDER ②
129	—	VENT VALVES ②
210	—	DROP WEIGHT ①
		TAIL DROP RODS ④
		HATCH LOCK ①
214	—	RUDDER ARM ①
		EMERGENCY O_2 BOTTLES ②
		LIGHTS OUTSIDE ①
224	—	MOTOR SHAFT EXTENSION TUBE ②
226	—	SHAFT PACKING HOUSING (OUTSIDE) ①
227	—	BALL OUTSIDE ①
236	—	BALL HOUSING ①
242	—	HYDRAULIC RESEVOIR ①
253	—	STROBE ①
260	—	SLURP GUN PUMP ①
→		HATCH & TAIL CONE = .250 SECTION (CUT & GLUE)

026 - Trackpoint cable (1)

024 - New packing gland seals (outside) (1) ea. (3) total

215 H.P. ALUM. AIR TANKS 3000 PSI