User Manual For
Amron International, Inc.

Model 9100-ICS2
Internal Chamber Conditioning System

1380 Aspen Way, Vista California 92081-8349
United States of America
Phone: (760) 208-6500
Fax (760) 599-3857
Email: sales@amronintl.com
Web: www.amronintl.com

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1 INTRODUCTION AND SPECIFICATIONS

1.1 INTRODUCTION

The AMRON INTERNATIONAL Inc. Model 9100-ICS2, Internal Conditioning System is designed to heat or cool (dehumidify) Hyperbaric Chamber – Deck Decompression Chambers. The Model 9100-ICS2 is used in conjunction with an external conditioning system, (the Amron Model 9000-ECS), which supplies heated/cooled fluid, and is located outside the chamber.

Temperature control is provided by circulating heated/chilled water through a set of coils inside the chamber (inside conditioning unit), where fans blow chamber air across the coils picking up the heat (cool) of the circulating fluid.

The temperature of the chamber can be raised or lowered depending upon the temperature of the circulating fluid.

Temperature control is accomplished by turning the internal conditioning system off upon reaching the desired temperature. If the unit has been wired for single/dual motor operation, one motor can be turned off.

Humidity removal is accomplished by circulating cold water through the internal conditioning system which causes moisture in the air to condense on the coils, lowering the humidity within the chamber.

NOTE: TEMPERATURE OF THE CIRCULATING FLUID MUST BE BELOW THE "DEW POINT" OF THE AIR WITHIN THE CHAMBER FOR CONDENSATION TO OCCUR.

If excessive condensation occurs, it may be necessary and desirable to install a drain line and collect the water. Depending upon the mounting orientation, determine the low point within the unit and drill a small hole (1/8 to ¼") close to the heat exchanger to permit the water to exit the enclosure.

The temperature range of the circulating water should be within the range of 25° F (minimum) to 110° F (maximum). Flow rates for the cooling fluid should be within the range of 3 to 6 GPM. Cooling/heating capacity of the units is affected by the temperature differential between the fluid being circulated through the heat exchanger and the air blown across the heat exchanger coil. The higher the differential, the greater the BTU capacity

There are two options for the source of chilled/heated fluid to circulate through the inside conditioning unit. First, and outside conditioning unit, i.e., the Amron Model 9000-ECS, which is a self-contained unit complete with circulating pump, temperature controllers, refrigeration unit, and heater. The second option is to use facility provided chilled water. Some facilities, such as hospitals use chilled water for air conditioning of the buildings. This source of chilled water can be used to provide cooling.

Check with the facilities manager regarding constraints on using the chilled water system. Generally these systems are a closed loop design, requiring the chilled water to be returned for cooling. Two different costs are involved, one for use of BTU's of cooling, and another, much higher cost, for loss of water. This usually requires that the system be configured as a secondary loop, with associated valves and in some cases a circulating pump for the loop. Some systems consist of a supply line and a return line.

The motor used within the Model 9100-ICS2, is a state of the art, single speed D.C. brushless design. The only moving parts of the motor are the bearings and rotor. The rotor is a permanent magnet assembly mounted on a stainless steel shaft. Voltage switching for the stator windings is accomplished by an all-electronic controller.

The controller is an integral part of the motor housing and is encapsulated in a ceramic filled epoxy material. This epoxy material was selected for its outstanding strength, high electrical insulation, thermal conductivity, and non-burning properties. The potting material meets MIL T-27 Grade 5, Class V; MIL 1-16923 Types C & D and UL non-burning requirements of 94V.

The Model 9100-ICS2 is suitable for use in most chambers. This includes units ranging in size from 54 inch through 72 inch diameters. There are certain conditions where the heat load may exceed the capacity of the unit. These conditions may occur when the chamber is being pressed to depth, when the chamber is located in direct sunlight; the chamber is being operated in a very high or very low ambient temperature, with a high number of personnel within the chamber, or a combination of these factors.

Most of these conditions can be overcome by operating procedures. During initial press down of the chamber, the amount of heat added to the chamber (compression of the air) will cause a rise in the temperature of the chamber. To compensate for this heat load, the chamber can be pre-cooled. Sun shades or other temporary structures can be erected for operating conditions outdoors or under extreme conditions.

1.2 SPECIFICATIONS

CAPACITY

Cooling	4000 BTU/HR
Heating	4000 BTU/HR
Fluid Flow Rate	3 G.P.M. @5 PSI
Fluid Media	50% Ethylene or Propylene Glycol, 50% Water
Capacity Approx.	1 Quart
Power Requirements	5.0 Amp Fused Supply
Voltage	24 VDC
Current	2.0 AMP, with 5 AMP Peak
Locked Rotor	Electrically Protected
Depth Rating of Heat Exchanger	1200 FSW
Input/Output Connections	1/2”Male J.I.C 37°
Location, Fluid	Left or Right
Temperature Range	25° to 110° F (-4° to 43°C)

MOTOR DESIGN

Enclosure	300 Series Polished Stainless Steel
Heat Exchanger	Copper/Nickel
Air Directors & Fan	Polished Aluminum, Nickel Plated

MECHANICAL

Motor	Single speed, Brushless DC Motor
Speed	3350 RPM, 230CFM @ 25 VDC
Motor Controller	Internal, Completely Potted

DIMENSIONS

Width	14.33 in. (364mm)
Depth	8.80 in. (223 mm)
Height	6.50 in. (163 mm)
Weight	28 lbs. (12.7 kg)

2 CONTROLS AND CONNECTIONS

Before using the Model 9100-ICS2 Internal Conditioning System, you should familiarize yourself with the features, connections, and proper installation. Improper installation could cause a reduction in performance or permanent damage could occur.

2.1 CONNECTIONS

2.1.1 Fluid Connections

Supply and return are located on the side of the unit. The connections can be moved to other side of the unit by removing the cover and the heat exchanger from the base plate. The heat exchanger is symmetrical, and the mounting to the base place can be reversed, relocating the input/output connections to the opposite side of the unit.

2.1.2 Power connection

The power connection is located on the air outlet end of the unit (end with the louvers). Connection is via a 4 pin MS connector. Pins “A” (+) and “B” (-) are power in for one motor, pins “C” (+) and “D” (-) are power in for second motor.

2.2 CONTROLS

2.2.1 ON – OFF Control

Install two (2) switches on the chamber control panel to control power individually to each of the two motors.

2.2.2 Single/Dual Motor Operation

For single motor operation, pins “A” (+) and “B” (-) should be wired to a switch. Closure of the switch contacts causes one motor to run. For dual motor operation, Pins “C” (+) and “D” (-) should be wired to a second switch. Closure of the switch contacts causes the second motor to run.

3 INSTALLATION AND OPERATION

3.1 INSTALLATION

3.1.1 **Location –** Select a site which provides clearance for air circulation, and is convenient for plumbing and electrical connections.

3.1.2 **Ventilation requirements –** The unit circulates air for cooling of the chamber air. Air is drawn in from one end of the unit and exhausts air from the other end. The unit should have a minimum of four inches of clear space on each end for air circulation.

Consider air flow when selecting a location for mounting the unit. Try to select a location which will enhance the air circulation within the chamber. Give consideration to the adjustable louvers and how they may be used to direct air towards or away from chamber occupants. The unit may be operated in any plane or altitude, the preferred method is any direction except upside down (base plate on top.)

3.1.3 **Mounting -** To mount the unit, first remove the cover by removing the six crews (3 each side) and lift the cover off. Note: the cover, and fan assembly are removed as one unit. Check the location of the input/output connections, if desired, relocate to opposite side. Mount base plate as desired.

3.1.4 **Plumbing -** Supply and return connections are routed to the chamber connections for the inside conditioning unit. Supply and return connections are 1/2” JIC (male); tubing runs should be 1/2” tube. NOTE: Hull stop valves must be installed in both the supply and return lines, valves must be installed within one foot of the penetrator. Pressure rating of the tubing runs INSIDE OF THE CHAMBER must be greater than the maximum depth rating of the chamber. Tubing should have a minimum temperature rating of 0 to 125°F. Amron’s recommendation is 1/2” stainless steel or copper tubing.

Connect the supply and return lines from the chamber inside conditioning unit connections to the chamber penetrator being used for the fluid. It does not matter which line is connected to which inside condition unit connection.

Pressure test all tubing runs and connections to 1-1/2 times the maximum working pressure of the chamber. Note: Do not exceed 900 PSI. Verify there are no leaks.

3.1.5 **Power -** Make power connections as desired, use 18 AWG Teflon wire, MIL Spec W-16878 Type E or EE, for internal wiring if using conduit. Use Neoprene rubber 18 AWG type SJO for other configurations.

Outside the chamber any good quality 18 AWG wire can be used. The outside wiring should include a fuse (5AMP) and “ON/OFF” switches. Both the fuse and switches should be located in the positive lead of the power supply.

3.1.6 **Tubing -** Supply and return tubing lines outside of the chamber should be a minimum of 1/2” diameter, for runs up to 20 feet in length. For lengths longer than 20 feet we recommend ¾ or 1 inch tubing. Both the supply and return lines should be insulated for efficiency and to prevent condensation on the cooling cycle. Use foam pipe insulation material between ¾” to 1” thickness.

3.2 OPERATION

3.2.1 Turn conditioning system on, check for leaks, and replenish fluid level when the system has filled the tubing runs and the inside conditioning unit.

NOTE: DO NOT OPERATE THE SYSTEM WITHOUT FLUID, AS THE CIRCULATING PUMP (OUTSIDE CONDITIONING UNIT) REQUIRES FLUID FOR LUBRICATION AND COOLING.

3.2.2 Turn the external conditioning unit ON selecting either heat or cool as required. Turn internal conditioning unit ON, select single or dual motor operation.

3.2.3 Allow unit to cool or heat the chamber as required. Upon reaching the desired temperature, the unit can be turned OFF or select single motor operation as desired.

3.2.4 The output air louvers can be adjusted to direct the air flow as desired. To adjust, turn louvers as desired to direct the flow of air.

4 MAINTENANCE AND TROUBLESHOOTING

Maintenance should be performed by trained personnel. A technician trained in decompression chamber maintenance should be used for any servicing of equipment used in a chamber system.

4.1 RECOMMENDED MAINTENANCE SCHEDULE

The following sections outline the recommended scheduled maintenance for the Internal Conditioning System

4.1.1 Before and After each Dive or Treatment

Check condition of unit and proper operation. If any of the following conditions are noted, schedule service and correct before using the unit. Unit makes excessive or unusual noise, fasteners are loose, fittings are loose or leaking, wiring or conduit runs are not secure and in good condition (no frayed wiring and connections are tight and secure) and check for corrosion.

Note: Unit need not be disassembled unless visual inspection or suspected problem is noted.

4.1.2 Annual Inspection

Remove cover and inspect; check condition of unit as noted above. Clean unit, if necessary, remove heat exchanger coil and wash. Assemble unit; if heat exchanger coil was removed, pressure test unit to 1-1/2 times maximum pressure rating of the chamber system and inspect for leaks. Run a performance test on the unit.

4.1.3 Five Year Interval

Complete annual inspection and pressure test fluid circuit. Fluid circuit pressure test should be conducted with unit installed and at 1-1/2 times maximum operating pressure of chamber. Record results of test

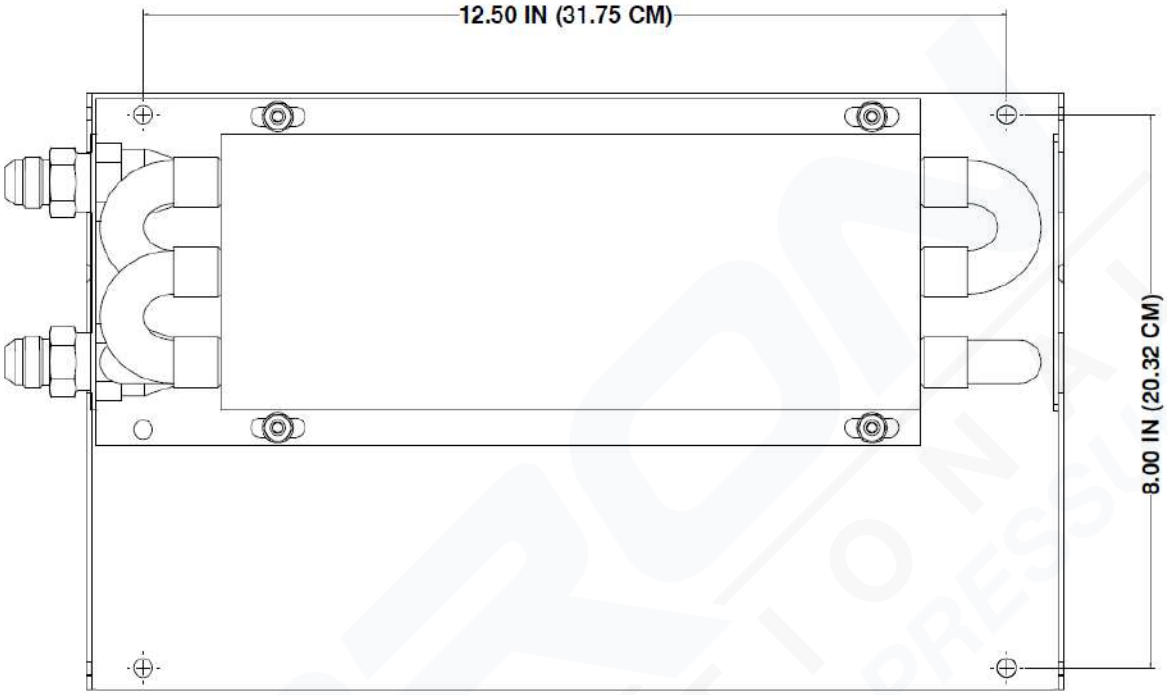
4.2 TROUBLESHOOTING

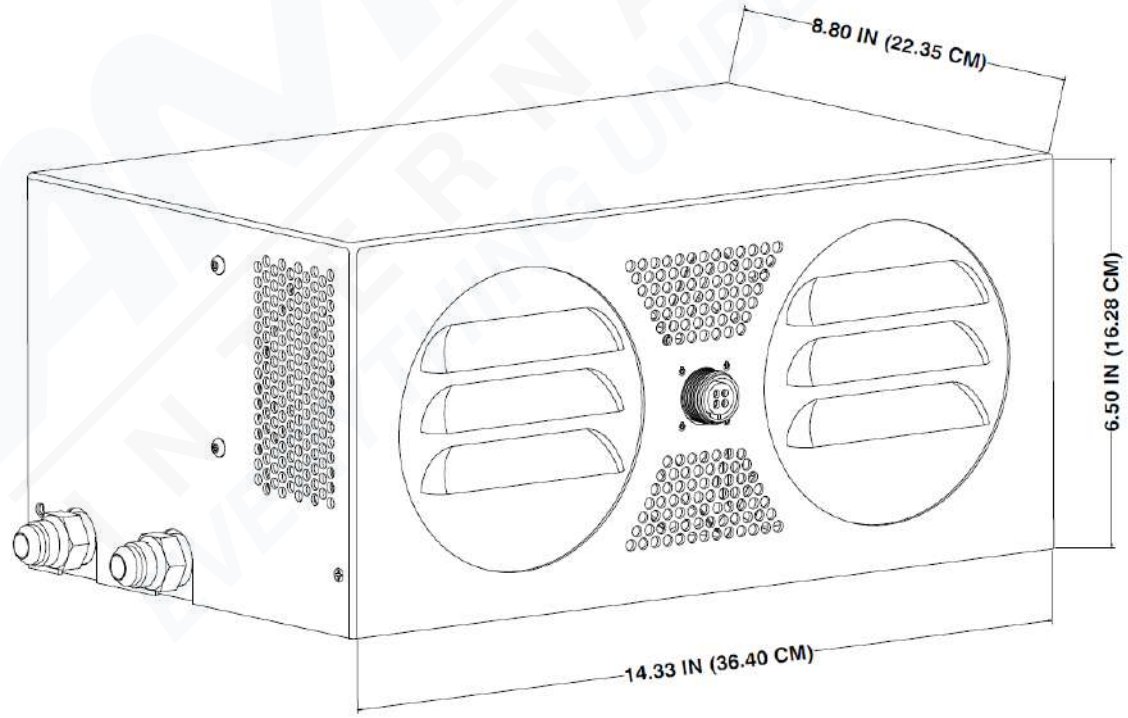
PROBLEM	SOLUTION
Unit does not run.	Check power source.
Unit does not run but power OK.	Check fuses and switches to motor.
Unit does not run, power Ok, fuses OK.	Check for 24 VDC at motor.
Unit will not heat.	Check temperature of circulating fluid.
Unit will not cool.	Check temperature of circulating fluid.
Unit will not heat or cool.	Check for fluid flow.

5 DRAWINGS

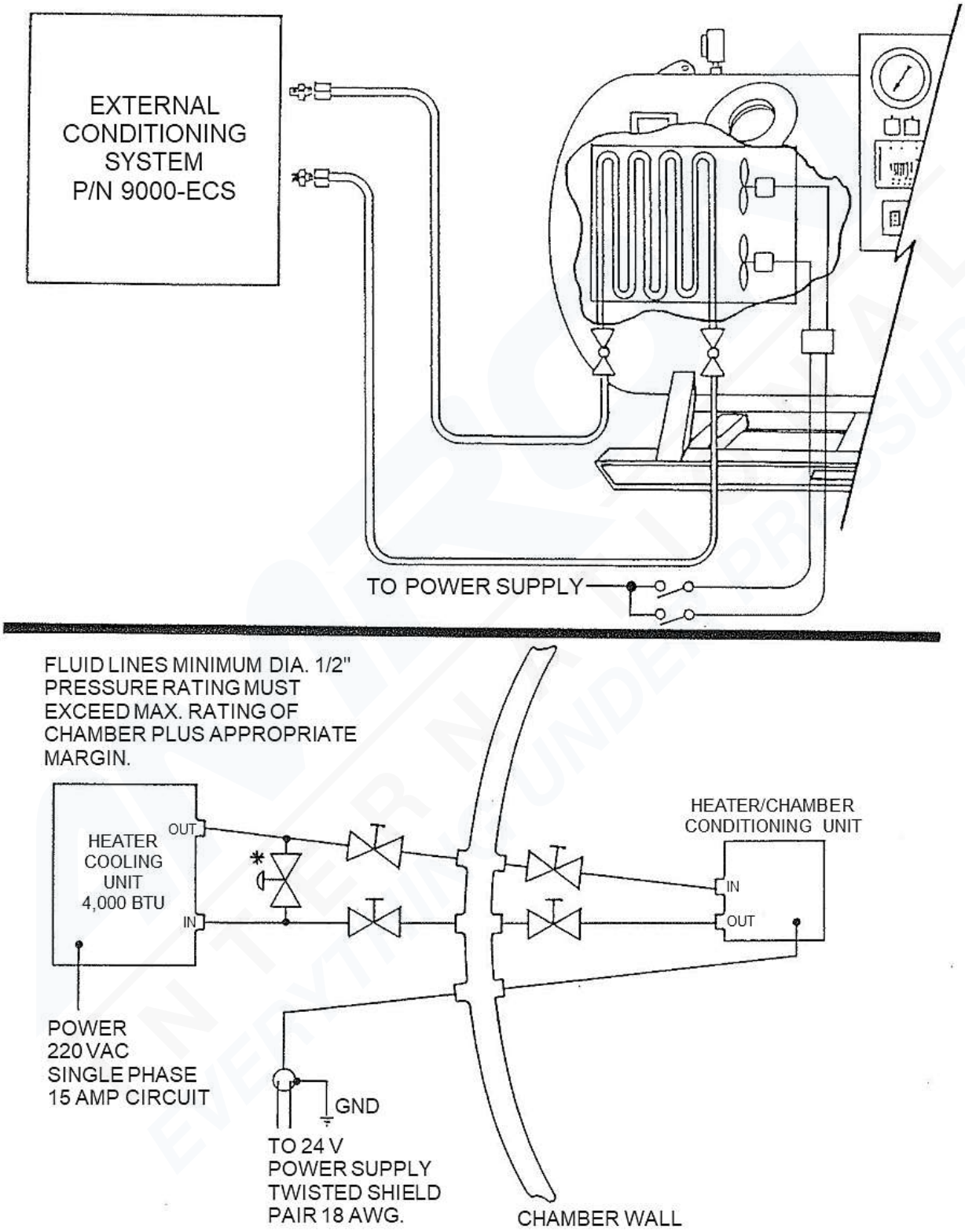
The following drawings illustrate the electrical and mechanical details of the Internal Conditioning System unit. The drawings reference identifier numbers which correspond to the parts list identifier numbers to aid in the identification of parts used in the Model 9100-ICS2.

5.1 DIMENSIONS 9100 ICS2

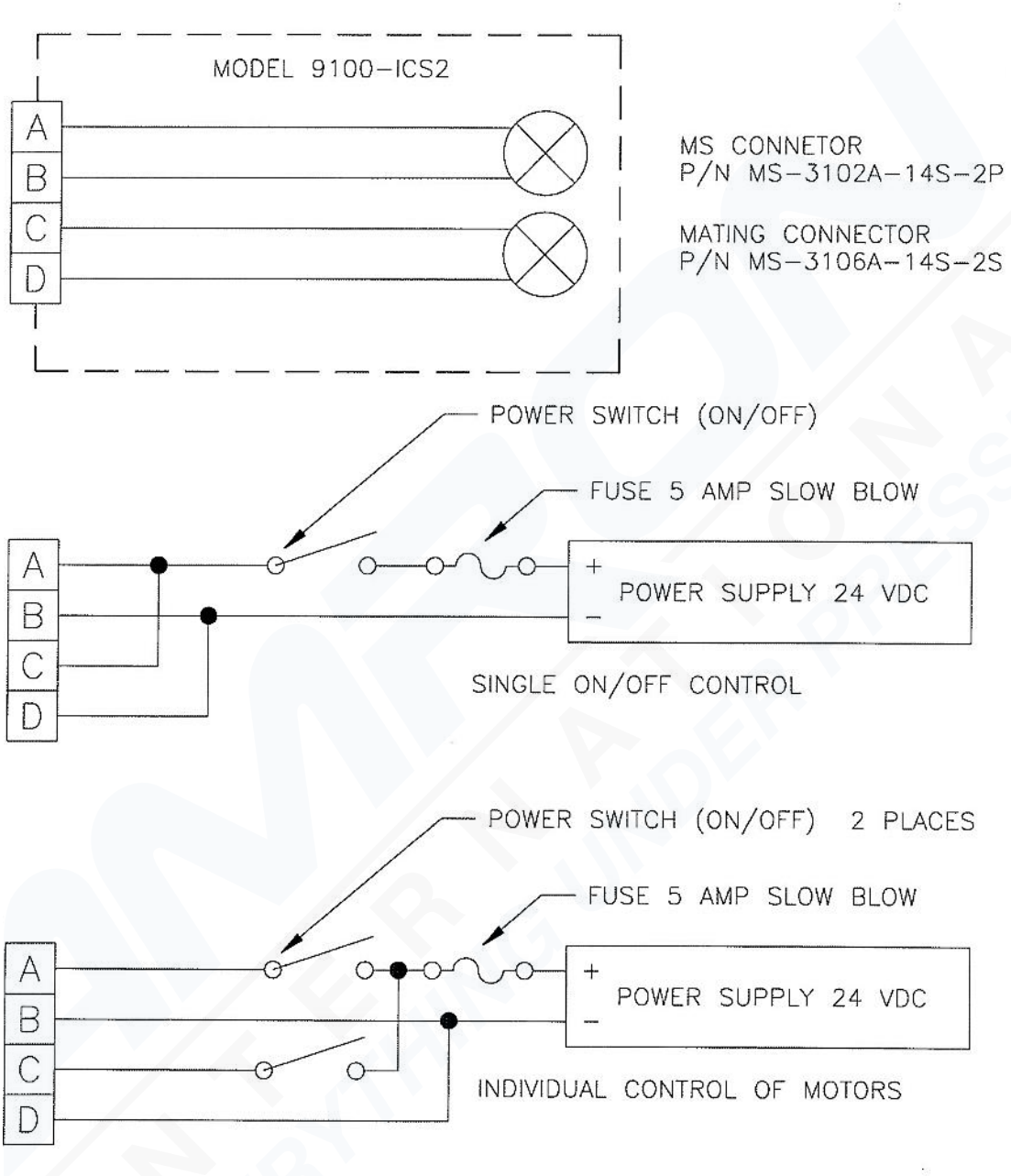




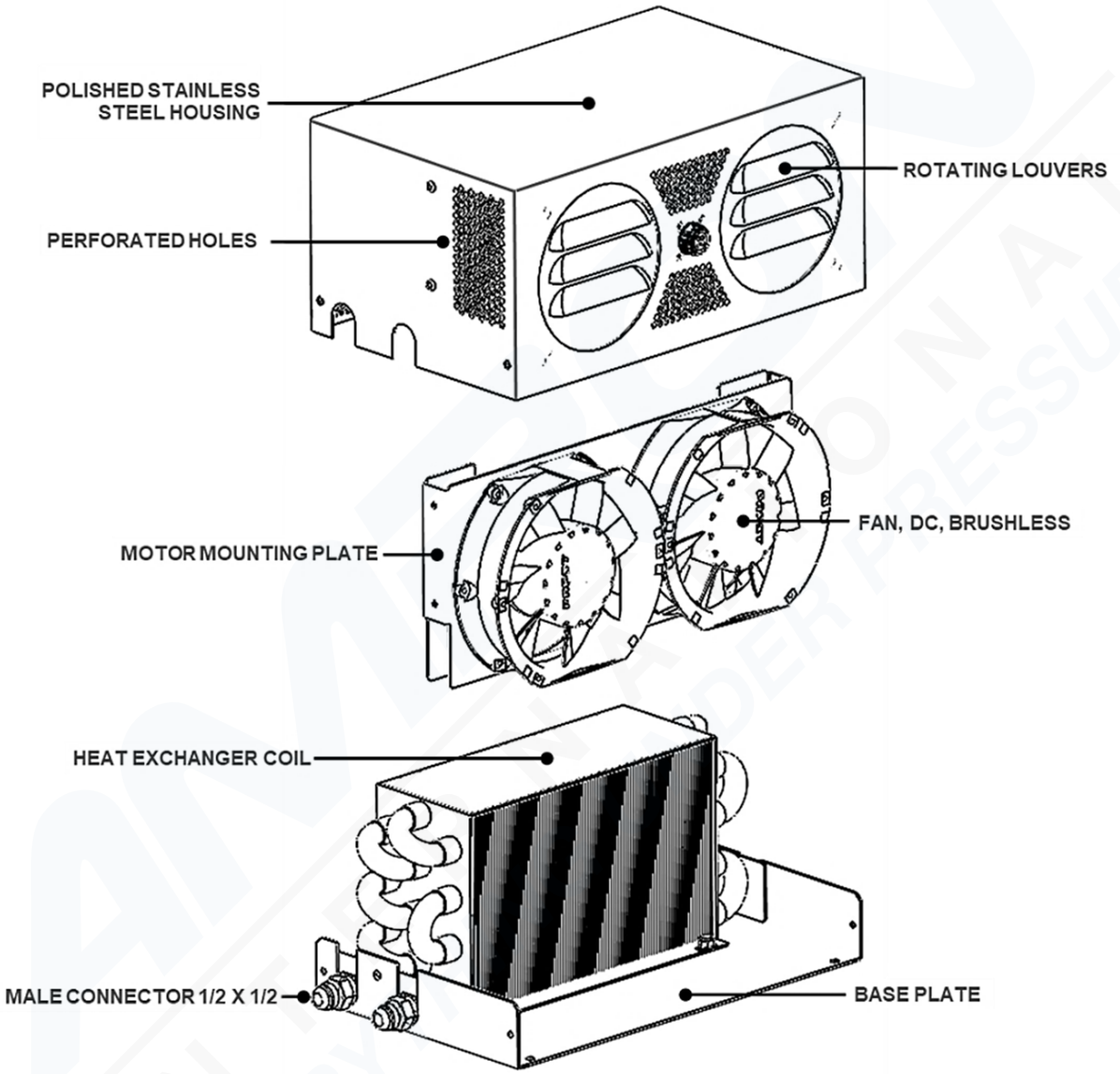
5.2 **CONNECTION DIAGRAM**



5.3 CONTROL WIRING DIAGRAM, MODEL 9100-ICS2



5.4 PARTS LOCATOR



6 PARTS LISTS

The parts lists include both mechanical and electrical parts. The following information will be useful in interpreting data which is not self-explanatory.

REVISIONS

The parts lists in this manual are for the current model of diver communicator as of the printing date.

To Order Replacement Parts Contact:

Amron International, Inc.
1380 Aspen Way, Vista, California, 92081 U.S.A.
Telephone: (760) 208-6500 Fax: (760) 599-3857
Email: sales@amronintl.com
Web: www.amronintl.com

When ordering replacement parts, you should give as much information as possible to enable us to supply the correct part. This information should include the part number, description, reference designator, value, radio model number, and serial number. Failure to provide sufficient information may hinder our ability to fill your parts orders promptly and correctly.

6.1 9100-ICS2 –ENVIRONMENTAL CONDITIONING SYSTEM

Part Number	Description
9100-001	Polished Stainless Steel Housing
9100-002	Base Plate
9100-003	Heat Exchanger Coil
9100-015A (2 ea.)	Fan, DC, Brushless Complete (for serial no. 2231761 and lower)
9100-012	Bracket Mounting 2 Motors (for serial no. 2231761 and lower)
9100-015B (2 ea.)	Fan, DC, Brushless (for serial no. 2231762 and higher)
9100-014	Bracket for 2 ea. Fans (for serial no. 2231762 and higher)
9100-007 (2 ea.)	Louver Plate
9100-008	Plate, Side Cover
FTX-B-8-8 (2 ea)	Male Connector 1/2 x 1/2
MS-3102A-14S-2P	MS Connector, Bulkhead 4 Pin Male
MS-3106A-14S-2S	MS Connector, Matting Cable 4 Pin Female
MS-3057-6A	MS Cable Clamp

7 LIMITED WARRANTY AND SERVICE POLICY

Amron International, Inc.

LIMITED WARRANTY & SERVICE POLICY

LIMITED WARRANTY

AMRON INTERNATIONAL, INC., (Amron) warrants that its manufactured products are free from defects in material and workmanship under normal use and service for a period of one year from date of shipment as described in Amron's literature covering this product. Oxygen Treatment Hoods and accessories are excluded and limited to 90 days. Amron's obligation under this warranty is limited to the repair of or replacement, at Amron's option, of defective material. This warranty shall not cover defects which are the result of misuse, negligence, accident, repair or alterations.

SERVICE POLICY

For technical assistance or to request a repair, please complete one of the following:

- *Amron Communicator Repair* : https://www.amronintl.com/communicator-repair-form
- *Repair Request* (all other products): https://www.amronintl.com/repair-form
- Call (760) 208-6500, Monday – Friday, 8 a.m. to 5 p.m. PST.

Both MODEL NO. and SERIAL NO. are required fields to be entered on the *Amron Communicator Repair Request* form and can be found on the products identification label as shown below.

"Sample" Product Identification Label

Do not return any product without obtaining a RMR (Return Materials Request). Detailed return instructions will be provided at the time of request.

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