ALTRONIC RESEARCH, INC.

P.O. BOX 249
YELLVILLE, ARKANSAS 72687-0249
U.S.A.

MODEL 5810
INTEGRATED COAXIAL LOAD
& HEAT EXCHANGER

MODEL 5810

INTEGRATED COAXIAL LOAD

& HEAT EXCHANGER

LIMITED WARRANTY

We take pride in manufacturing products of the highest quality and we warrant them to the original purchaser to be free from defects in material and workmanship for the period of one year from date of invoice. Additionally, products of our manufacture repaired by us are warranted against defects in material and workmanship for a period of 90 days from date of invoice, with the provisions described herein.

Should a product, or a portion of a product of our manufacture prove faulty, in material or workmanship, during the life of this warranty, we hereby obligate ourselves, at our own discretion, to repair or replace such portions of the product as required to remedy such defect. If, in our judgment, such repair or replacement fails to be a satisfactory solution, our limit of obligation shall be no more than full refund of the purchase price.

This warranty is limited to products of our own manufacture. Equipment and components originating from other manufacturers are warranted only to the limits of that manufacturer's warranty to us. Furthermore, we shall not be liable for any injury, loss or damage, direct or consequential, arising out of the use, or misuse (by operation above rated capacities, repairs not made by us, or any misapplication) of the equipment. Before using, the user shall determine the suitability of the product for the intended use; and the user assumes all risk and liability whatsoever in connection therewith.

The foregoing is the only warranty of Altronic Research Incorporated and is in lieu of all other warranties expressed or implied.

Warranty returns shall first be authorized by the Customer Service Department and shall be shipped prepaid. **Warranty does not cover freight charges.**

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PRECAUTIONS

≈≈DANGER≈≈

Do not attempt any service or parts replacement without first disconnecting all AC power and RF power. Failure to do so may result in serious or *fatal electrical shock*.

!!!WARNING!!!

Do not apply any RF power to the unit before transmitter interlock is connected and operational. Application of RF even momentarily if unit is off or coolant flow is restricted will result in damage to equipment. Do not apply more than rated power to unit. Damage will occur before thermal protectors can activate interlock circuit if more than rated power is applied.

WARNING

Ethylene Glycol may cause permanent damage to the kidneys, liver and other organs if ingested. Avoid excessive contact with skin or eyes. See the Material Safety Data Sheet for the specific precautions and first aid measures prescribed by the manufacturer.

CAUTION

Operation above rated ambient temperature may result in motor thermal protection shutting off fan which will cause damage to unit. Provisions are made to trip interlock in the event of overheat; however care should be taken to operate the unit below stated maximum operating ambient temperature.

PRECAUTIONS

CAUTION

Do not block air grills or restrict airflow when ducting inlet and discharge air. Restrictions in airflow limit the heat exchanger's ability to dissipate RF power and could damage and/or cause the unit to fail.

CAUTION

Do not operate pump with coolant low or empty. To do so will result in damage to working parts and seals.

CAUTION

Do not use any stop leak, sealants, automotive antifreeze or Union Carbide Ucartherm™ in coolant. Use only pure ethylene glycol and potable water!!!!

CAUTION

Heat Exchanger is difficult to drain completely! When draining for the purpose of shipping or freeze protection it is necessary to flush the unit with 35% Ethylene Glycol and potable water mixture. Freeze damage to the coils or other components may result from failure to drain properly. *FREEZE DAMAGE IS NOT COVERED UNDER THE WARRANTY.*

NOTICE

Failure of unit due to accumulation of solids in water will void the warranty.

INTRODUCTION

This handbook is for technical personnel as an aid in understanding and performing installation, service and maintenance procedures for the OMEGALINE® Model 5810 Heat Exchanger Load. Personnel are considered to be skilled if they have the necessary knowledge and practical experience of electrical and radio engineering to appreciate the various hazards that can arise from working on radio transmitters, and to take appropriate precautions to ensure the safety of personnel.

SECTION I

DESCRIPTION AND LEADING PARTICULARS

1-1. Purpose and Application of Equipment. The OMEGALINE® Model 5810 Heat Exchanger is designed to safely dissipate a maximum of 10,000 watts of electrical energy over a frequency range of 60 Hz to 800 MHz.

1-2. Equipment Supplied. The Model 5810 Heat Exchanger is supplied with a standard RF connector. The designations are:

1 5/8" Swivel flange:	Model # 5810E1
3 1/8" Swivel flange:	Model # 5810E3
3 1/8" Unflanged:	Model # 5810R3

The standard power supply voltages and their designators after the Model # are:

-115: 115-130VAC, single phase, 60 Hz
-230: 208-230VAC, single phase, 60 Hz
(230VAC, 50 Hz operation is available at additional cost)

1-3. Equipment Required But Not Supplied. The Model 5810 Heat Exchanger is complete as supplied, but the user must furnish RF input, interlock control cable, power supply cable, ground cable and proper coolant. Where the purchaser specifies that the coaxial load be remotely mounted, it will be necessary for the user to supply suitable piping or hoses to connect the load to the heat exchanger.

1-4. General Description. The Model 5810 Heat Exchanger is an assembly of a Model 9715 RF Coaxial Load and a heat exchanger assembly. The heat exchanger is essentially a reservoir, a pump and a radiator intended to dissipate the heat produced by the load. The complete Model 5810 is normally

enclosed in a single aluminum case, but the purchaser may specify remote mounting for the load to facilitate installation. AC mains power connection is made through a NEMA locking-type receptacle mounted on the front panel. This panel also contains a 4-screw barrier terminal strip for connection of the interlock circuit. The main chassis frame contains a pump, a fan, a flow switch, a time delay relay, reservoir, heat exchanger coil and associated controls.

1-5. Electrical Description. The Model 5810 includes a 50 ohm non-reactive resistor assembly capable of dissipating 10,000 watts of applied electrical energy at frequencies between 60 Hz and 800 MHz with a maximum VSWR of 1.1 to 1 to 800 MHz. No provisions are made for tuning the resistor assembly. Power to the blower and pump is controlled by a single On/Off switch (located on the front panel along with AC power, low coolant indicator, and overheat indicator lamp). The transmitter interlock circuit consists of flow switch, delay relay and thermal switch wired in series to control the interlock relay. Power is supplied to this relay whenever the equipment is attached to the correct power supply, neither the overtemperature thermal switch (82°C/180°F) or flow switch senses a fault and the time delay relay is activated (approx. 10 seconds after the flow switch has closed). A lamp is provided to indicate when one or more of these switches is open. It is labeled ***OVERHEAT*** and indicates any change in state of the interlock circuit.

1-6. Mechanical Description. The Model 5810 RF Heat Exchanger is a Model 9715 50 ohm resistor assembly cooled by a vented, closed-loop water system, utilizing a centrifugal pump, water-to-air heat exchanger (capacity of coolant is approximately 1.5 U.S. Gal.), and 1 centrifugal blower. The blower moves air into a closed plenum, through the heat exchanger coil, to the side of unit.

1-7. General Principle of Operation. After ascertaining that the Model 5810 is connected to the correct power supply and filled with coolant, connect the transmitter interlock circuit and RF source. Turn the main power switch ON to start operation and enable transmitter. Operate transmitter as desired. To stop operation, it is necessary to first turn off the transmitter, then wait five minutes before turning off the power switch on the load. It is important that the unit cools down and temperatures stabilize before fan and pump operation stops.

1-8. Interlock Controls and Operation. A 4-screw barrier terminal strip is provided on the left side panel for transmitter interlock. This terminal provides a normally closed and a normally open pair. The N/C pair is usually used for the transmitter interlock. It is highly recommended that the N/O pair be used for an alarm to indicate a malfunction. If there is an AC power failure,

the interlock will not indicate a malfunction unless the alarm is independently powered.

1-9. Operating and Adjustment Controls. The only operating control is the main power switch. No field adjustments are necessary or possible.

1-10. Operator Training. The operator of this equipment must have the following skills/knowledge:

- An understanding of the purpose of the equipment;
- An understanding of the principles of operation of the equipment;
- An understanding of the normal operating procedures for the equipment;
- An understanding of the normal and abnormal indications which may be presented at the control point;
- The proper procedures for stopping the equipment under abnormal or emergency conditions;
- The proper procedure to lock out and mark controls prior to allowing or commencing maintenance on the equipment;
- The proper procedure to obtain clearance to remove lockouts and out-of-service marks and return the equipment to normal service.

SECTION II

TEST EQUIPMENT AND SPECIAL TOOLS

2-1. <u>Test Equipment Required.</u> No test equipment is required for routine maintenance, however it may be necessary to verify DC resistance of the coaxial resistor and/or verify coolant temperature, in which case you will need an accurate digital ohm-meter and precision thermometer.

2-2. <u>Special Tools Required.</u> Although no non-standard tools are required for routine maintenance, we recommend the technician have the following specialized tools available:

1 Tee handle hex key, 5/32 inch
1 Tee handle hex key, 3/32 inch
1 Tee handle hex key, 3/16 inch
1 Power screwdriver with torx T-15 bit
1 Torx T-15 screwdriver
1 Hydrometer (Range 1.000 to 1.070)
1 pH Test Kit (Range 7.0 to 8.2)

SECTION III

PREPARATION FOR USE AND RESHIPMENT

3-1. Unpacking. The unit should be handled and unpacked with care. Inspect outer carton for evidence of damage during shipment. *Claims for damage in shipment must be filed promptly with the transportation company involved*. No internal packaging or bracing is used for domestic shipments and the unit should not rattle when being unpacked.

3-2. Visual Inspection. Conduct a thorough inspection of the unit, paying particular attention to the following items:

- Screws in place and tight.
- All panels and grills free of dents and scratches.
- Interlock terminal strip visually OK.
- RF connector visually OK. While inspecting RF connector, measure D.C. resistance of the unit by reading from the center conductor to the outer conductor. It should be 50 ohms (nominal).

3-3. Pre-installation Tests. Prior to installation, fill unit with specified coolant (see para. 3-4), then connect unit to a suitable source of AC power. Turn main switch on and check for quiet blower operation. Connect an ohmmeter or a battery operated test lamp across the normally closed terminal pair on the interlock terminal board (rear panel). Turn the main power switch off observing the indicator (ohmmeter or test lamp). It should change state (terminals open).

3-4. Coolant. The coolant should be potable water if the ambient temperature will not drop below +5°C (40°F). The U.S. Department of Public Health has set the standard for potable water at a maximum of 500ppm of total dissolved solids. The water hardness (content of calcium, lime and magnesium salts) should be less than 75ppm. These conditions can be achieved by mixing with distilled water. However, neither distilled nor deionized water should be used exclusively unless the pH is corrected to a value between 7.0 and 8.2. Acidic coolant solutions will cause early failure of the resistor.

SUGGESTION: If your municipal water has unpleasant tastes or odors, high salt or mineral levels (hardness, iron, sulfides, etc.), we suggest that you purchase bottled water (often sold as "spring water") for use in the load. It is very inexpensive insurance. If ambient temperatures are expected to fall below +5°C (40°F), a mixture of 35% technical grade ethylene glycol and potable water

may be used (with a 20% de-rating of unit to kW at some temperatures). See Specifications.

To fill unit, first connect unit to AC power, then fill reservoir with coolant. Turn unit on to pull coolant into circuit and add coolant again until LOW COOLANT light goes out. Continue adding coolant to bring level to 2 inches below filler neck top. Capacity of unit is approximately 1.5 U.S. Gallons (5.5 liters).

!!!CHECK FOR LEAKS FROM DRAIN PLUGS AND RESERVOIR DRAIN AT THIS TIME!!!

CAUTION
Do not use any stop leak, sealants, automotive antifreeze or Union Carbide Ucartherm™ in coolant.
Use only pure ethylene glycol and potable water!!!!

3-5. Installation. Consideration must be given to accessibility for maintenance and unit replacement. No attempt is made in this handbook to present complete installation instructions, since physical differences in plant will determine the installation procedure. General guidelines are outlined in subsequent paragraphs.

3-6. Location. The location selected for the Model 5810 should be dry, free of excessive dust and have an ambient temperature between +5°C and 35°C (41°F and 95°F) with water only, and -20°C and +30°C (-4°F and 86°F) with 35% ethylene glycol mixture. The room should be well ventilated to prevent excessive heat build-up. The RF dissipation of the unit is 10,000 watts. This equals 34,130 Btu/hr which ordinarily must be ducted out of the building envelope, using as short and direct duct run as is possible to minimize static pressure and to prevent loss of cooling efficiency. The assistance of a competent heating and air conditioning installer will help avoid over-or-under specifying the duct system.

3-7. Mounting. It is not necessary to mount the Model 5810, which is designed to be a free-standing device. It rests on four adjustable feet.

3-8. Connections. There are three connectors on the Model 5810: the RF connector, the AC power connector and the transmitter interlock (4 terminal, captive-screw terminal strip).

a. The RF connector is on the coaxial load, which is normally attached to the right side panel of the unit. Connect to the appropriate RF line from the transmitter.

b. The AC power connector is a NEMA L6-20P twist-lock receptacle mounted on the left side panel. A matching plug and flexible cord is provided.

c. The transmitter interlock is attached to the normally closed terminals of the terminal board on the left side of the unit. The terminals close approximately 10 seconds after the power switch is on and the unit is operating properly. The normally open pair is isolated from the normally closed pair and is provided for an alarm circuit.

CAUTION!

The unit should be attached to the proper AC power supply with interlock connected whenever the RF connector is attached to the source. Inadvertent application of RF power to the unit without AC power will damage or destroy the resistor assembly!!!

3-9. Ducting. In many installations it will be necessary to duct the discharge air from the Model 5810 to the exterior of the building. In some installations it will also be necessary to supply inlet air from outside of the climate controlled portion of the building. The discharge air flow is approximately 300 SCFM at a maximum temperature of 180°F. Due to the high temperatures involved, non-metallic duct materials should not be used. Make-up air is a ventilation term used to indicate the supply of outdoor replacement air to a building in a controlled manner. Replacement air will enter the building to equal the volume actually exhausted, whether or not provision is made for this replacement. It is important to plan for make-up air of the proper temperature and volume.

3-10. Adjustments. No field adjustments are necessary or possible.

3-11. Preparation for Reshipment. If unit is to be shipped by air freight or through an area where it is possible it will be exposed to freezing temperatures, it is imperative to prepare it properly for shipment.

NOTE: Drains are incorporated into plumbing to allow easy drainage of unit. There are three small drains with brass caps under the unit on the front near the center. There is a drain valve located near these drains. It drains the reservoir and part of the system. The drain valve is fitted for a 3/4 inch garden hose. Drain the coolant from the unit (the use of a wet vacuum cleaner is very helpful to prevent spillage) prior to shipment. After coolant is completely drained, add one gallon of technical grade ethylene glycol or DOWTHERM SR-1® coolant to the reservoir. Start the pump and circulate this fluid thoroughly throughout the system. Now drain the unit of all free-flowing liquid and close all drain valves. Fluid which is trapped in the system will not freeze and damage the unit. Care must be taken to protect the RF connector and to immobilize the swivel flange, if it is fitted with one. It is suggested that you retain the original shipping crate to provide the optimum protection during reshipment.

SECTION IV

OPERATION

4-1. <u>Overview</u>. The Model 5810 incorporates a Model 9715 Coaxial Resistor which dissipates RF energy by converting it to heat. The heat is then dissipated into the air via a vented, closed-loop water-to-air heat exchanger. This self-contained water system allows for the use of a water-cooled resistive load, providing the best possible RF Load in areas that do not have suitable water supplies. Where water temperatures less than +5°C could be encountered, a solution of 35% technical grade ethylene glycol may be used as a coolant (*Automotive Anti-freeze or Union Carbide Ucartherm™ must not be used*). The use of ethylene glycol mixture derates unit 20%.

4-2. <u>Control Circuits.</u> There are 2 control circuits in the Model 5810. One circuit controls the blowers and pump, the other controls the transmitter interlock circuit. The interlock circuit is controlled by a flow switch (detects adequate water flow) connected in series with a time delay relay that allows a short period of time after the water is flowing before energizing the interlock. This series circuit also contains the overtemperature thermal switch, which is mounted on the reservoir. The blower is controlled by the main power switch. The pump is turned on by the main power switch. The Low Coolant Lamp is controlled by a float in the reservoir and is for indication only. It is not connected to the interlock.

4-3. <u>To Begin Operation.</u> After following installation instructions, turn main power switch to *ON*. Initially, the *OVERHEAT* lamp will illuminate and will extinguish about 10 seconds later. Unit is now ready for operation. The transmitter interlock will normally close approximately 10 seconds after the unit is turned on. Delays greater than 15 seconds may indicate marginal flow and should be investigated.

4-4. <u>To Shutdown.</u> *WARNING! Transmitter must be turned off prior to shutting down load to prevent damage to load resistor.* After RF power has been turned off, ***wait 5 minutes*** before turning off load to allow heat in the unit to be stabilized and dissipated. Transmitter interlock will open when unit is turned off.

4-5. <u>Performance.</u> The Model 5810 will handle 10KW continuously at a maximum ambient temperature of 35°C using pure potable water. See SPECIFICATIONS for other conditions. Thermal performance is affected by impurities and chemicals in the coolant. Therefore, only potable water or an approved strength mixture of technically pure ethylene glycol and potable water should be used as a coolant. Accumulations of scale and other contaminants will greatly reduce the thermal efficiency and cause the unit to overheat and fail.

SECTION V

MAINTENANCE

WARNING!!
BEFORE PERFORMING ANY MAINTENANCE:

PERSONNEL WORKING ON THIS LOAD MUST BE CONSIDERED SKILLED AS DEFINED BY *EN60215 SECTION 3.1 AND APPENDIX D*

1. **DISCONNECT POWER AND ALLOW MOTOR TO COME TO A FULL STOP.**
2. **DISCONNECT RF CONNECTOR ASSEMBLY AND LOCK OUT TRANSMITTER OPERATING CONTROLS.**
3. **DISCONNECT TRANSMITTER LINE.**

FAILURE TO FOLLOW THESE DIRECTIONS MAY CAUSE FATAL ELECTRICAL SHOCK!

5-1. Cleaning. The enclosure of the Model 5810 is finished with a durable coating system. It should be cleaned with a neutral plastic and glass cleaner such as Miller-Stephenson MS-260. The RF connector should be cleaned with a non-residue contact cleaner such as Miller-Stephenson MS-230. Remove dirt accumulations from the fan and motor by vacuuming. Do not use solvents or an air jet, as these can damage the motor. Remove dirt and dust accumulations from the grills and resistor assembly with an air jet and a soft brush. This should be done annually or more often if in a dirty environment.

5-2. Lubrication. The only lubrication required is for the bearings in the blower motor. Units in continuous service should be re-oiled annually, intermittent duty units every two years and occasional duty units every three years. Re-oil by removing the plastic plugs in the lubrication ports and applying 30 to 35 drops of SAE 20 motor oil. DO NOT OVER OIL.

5-3. Periodic Maintenance. The RF Load Resistor does not require any periodic maintenance, however a DC resistance check prior to each use is recommended. Repair to resistor unit is covered in Section VII.

5-4. Routine Service Checks. Check coolant level weekly if used intermittently, more frequently if used continuously. If ethylene glycol mixture is used as

coolant, the mixture must be periodically verified using a precision hydrometer (range 1.000 to 1.070) or other suitable instrument to prevent the ethylene glycol from becoming too concentrated. A mixture more concentrated than 35% will lower the efficiency of the unit possibly causing a failure. An acidic condition will cause rapid failure of the resistor. Maintain pH at 7.0-8.2.

WARNING!

USE OF ANYTHING OTHER THAN PURE POTABLE WATER OR A MIXTURE OF TECHNICAL ETHYLENE GLYCOL AND POTABLE WATER, OR USE OF A MIXTURE MORE CONCENTRATED THAN 35% ETHYLENE GLYCOL WILL VOID THE WARRANTY!!!

NOTE:

BUILD-UP OF LINT AND DUST ON COILS GREATLY DECREASES THE EFFICIENCY OF THE UNIT. KEEP THEM CLEAN!

Check for lint and dust build-up on the inside of the cooling coil annually by removing the top panel. This is accomplished by removing the 20 #8-32 screws around the edge of the panel. This should be done annually or more often if in a dirty environment.

SECTION VI

CALORIMETRY

6-1. General. Physicists have long known that it takes a definite amount of energy in the form of heat to raise the temperature of a certain mass of liquid and conversely, if you know the temperature rise and the mass of the liquid, you can determine the amount of heat and therefore, the amount of energy applied to the liquid. There are many variables in this equation. Among them are: specific heat of the fluid, specific gravity of the fluid, density of the fluid, thermometer accuracy and flow meter accuracy. These factors must be determined or minimized to yield accurate power measurements. The OMEGALINE® Power Test Load System is designed to provide the user with data which can be reduced to an accurate transmitted power measurement.

6-2. Calorimetry Theory. Since we know from physics that we can determine energy put into a system by measuring temperature and flow rate, we have only to adjust our readings to account for variance from classic values in order to accurately determine transmitter power. The theory of RF calorimetry requires a liquid-cooled coaxial load of low VSWR, accurate thermometry and accurate flow measurement. Data from the thermometers is used to obtain the specific heat, specific gravity and density of the fluid. This information is used to obtain coolant and flow meter factors for use in calculating power values.

Some of the terms we use:

- **Specific heat (C_p)**: The number of calories required to raise one gram of a substance one °K.

- **Specific gravity (G)**: A ratio of the mass per unit volume at a known temperature to the mass per unit volume of pure water at the same temperature.

- **Density**: The mass per unit volume of a substance at a certain temperature.

6-3. Practical Calorimetry. Practical calorimetry with the OMEGALINE® Power Test Load System can be reduced to a systematic process requiring no technical skills beyond the ability to read instruments, use graphs and tables and calculate final values (a handheld calculator helps with the multiplication).

First, a warning! If you don't know what the fluid is, you'll never get a correct answer!

If your system uses "pure" water, i.e. tap water, distilled water, deionized water, etc., you know what the fluid is accurately enough for calorimetry. If your coolant is a mixture of water and ethylene glycol, you cannot be certain what your fluid is until you obtain the specific gravity of your fluid (corrected for temperature) with a laboratory grade hydrometer. Water evaporates from your coolant system, but ethylene glycol doesn't. Therefore, glycol concentrations vary almost daily in an operating system. In systems where fluid loss is made up with water/glycol mixtures, the concentration of glycol gradually increases. Be sure that you know what the specific gravity of your coolant is before you start! Use this value and the Ethylene Glycol Solution Densities chart to determine the percentage of ethylene glycol in your system. The percentage value is used in the calorimetry process.

To accurately determine the transmitted power going to the load:

1. Add clean water to each thermowell until water flows out of the small hole near the base of the column.

2. Turn on coolant flow and ensure that it is above the minimum value for your system.

3. After 2 to 3 minutes of transmitter operation, you may begin reading instruments.

4. Read flow meter and record observed ("gauge") value.

5. Read inlet fluid temperature and record this value.

6. Read outlet fluid temperature and record this value. Take this reading immediately after reading inlet water temperature.

7. Find the average value of the temperature readings recorded.
   $(\text{Temp}._{\text{in}} + \text{Temp}._{\text{out}} / 2)$

8. Use the average temperature from (7.) to determine K_t from the K_t Graph.

9. Use the outlet fluid temperature determined in (6.) to determine flow meter correction factor from the Coolant Density/Flow Meter Correction nomograph.

10. The equation used to solve the power problem:

$P = K_t \times (T_{outlet} - T_{inlet}) \times Q \times F$

Where: P = Power in kilowatts

K_t = Coolant correction factor

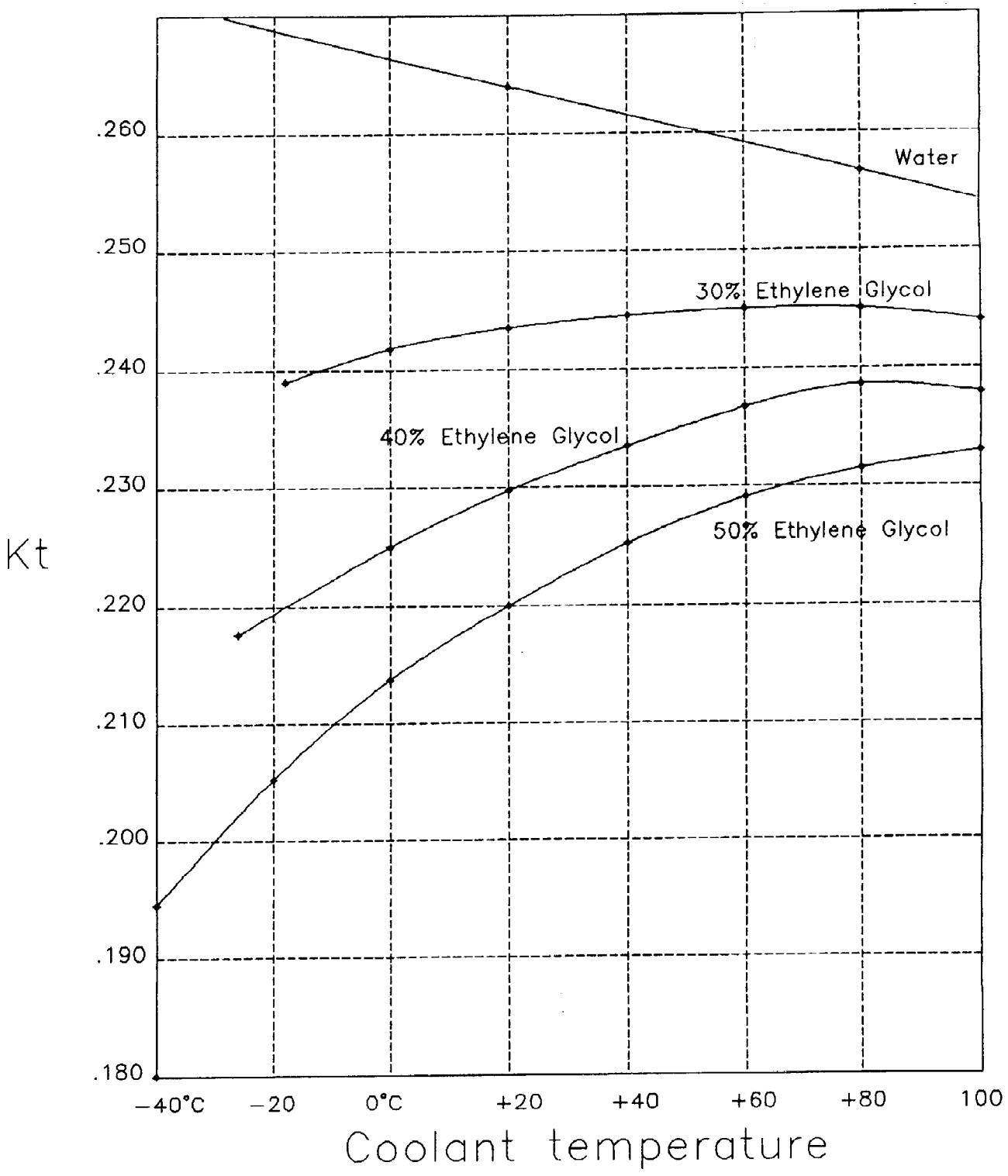
T_{outlet} is expressed in °C.

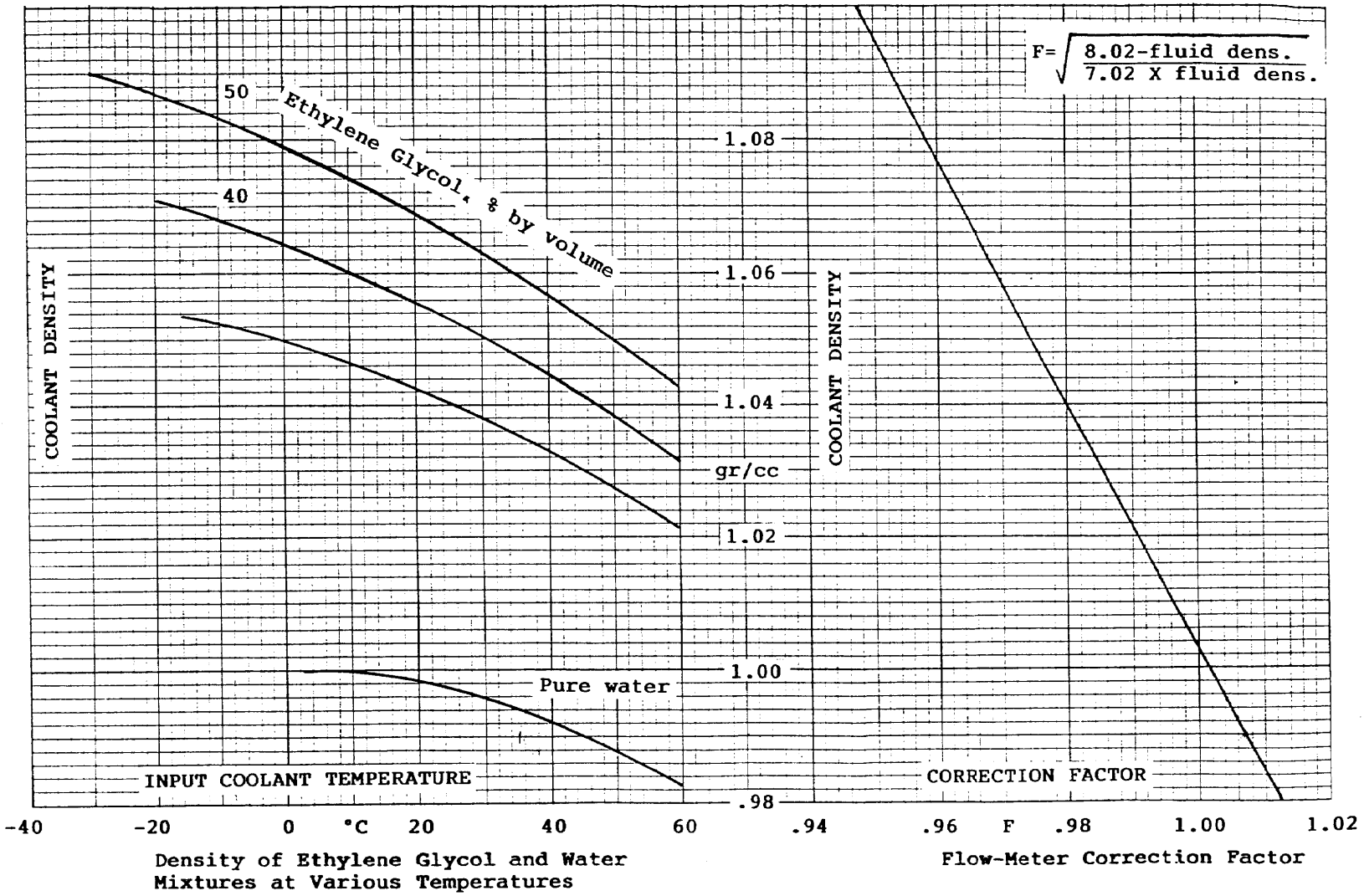
T_{inlet} is expressed in °C.

Q = Coolant flow in gallons per minute

F = Flow Meter Correction Factor

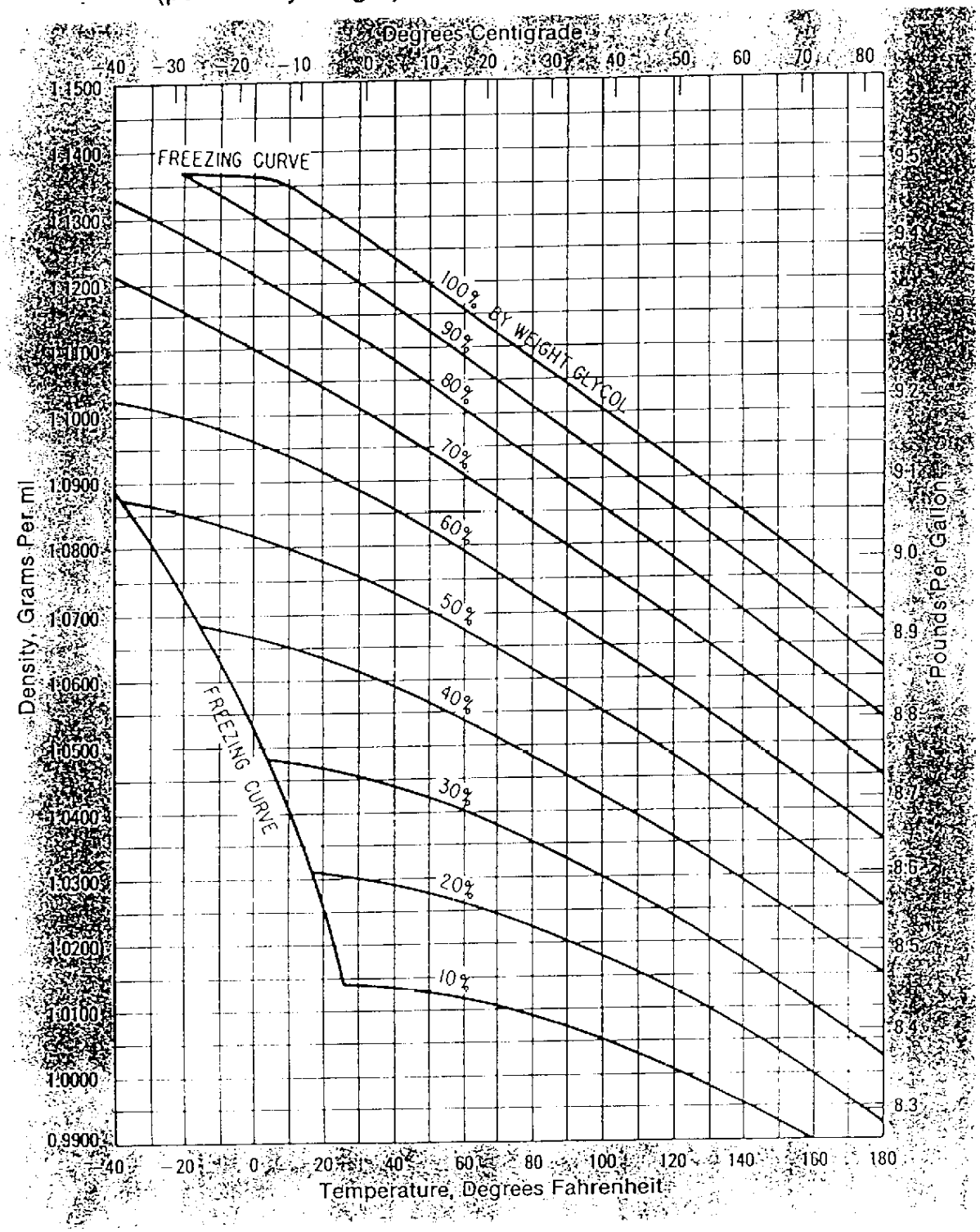
With the data obtained from earlier steps, you should be able to determine the transmitted power within ± 3%.


Kt
.260
.250
.240
.230
.220
.210
.200
.190
.180
Water
30% Ethylene Glycol
40% Ethylene Glycol
50% Ethylene Glycol
−40°C
−20
0°C
+20
+40
+60
+80
100
Coolant temperature



(The above graphs may be used together as a nomagraph)

— Densities of Aqueous Ethylene Glycol Solutions
(percent by weight)



SECTION VII

REPAIR PROCEDURES

7-1. Overview. The Model 9715 Coaxial Resistor is basically a termination type unit, having its characteristic impedance at the input end and tapered to zero impedance (short circuit) at the other end. The center conductor is a tubular resistor whose DC resistance is equal to the characteristic impedance of the line. The outer conductor of the coaxial line is a symmetrical horn-shaped enclosure, contoured in a semi-logarithmic taper to obtain practically a reflection-free termination. The RF dielectric medium consists of three distinct materials: the coolant, the teflon or noryl water jacket, and the air space. The housing is constructed of aluminum and bronze or brass. Coolant enters the load at the electrically shorted end, flows axially down the center of the resistor tube, mushrooms over into the annular channel under the water jacket, and makes a second pass over the resistor in direct contact with the resistive film. Thus the coolant makes intimate contact with both the inside and the outside of the resistor, providing optimum heat transfer with minimum coolant flow.

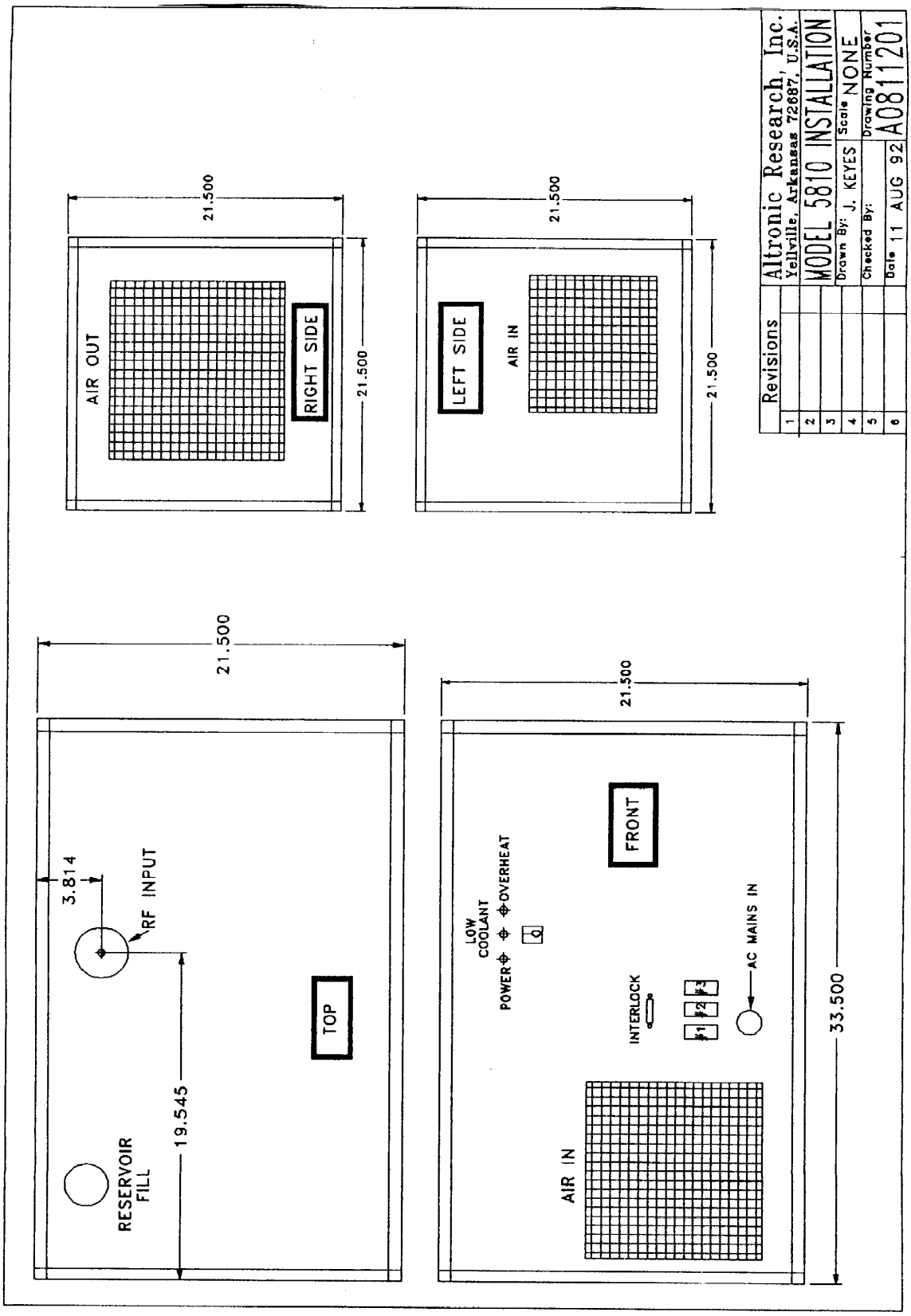
7-2. Resistor Replacement. Follow directions in the OMEGALINE® manual which pertain to the 9715.

7-3. Water Jacket Replacement. Follow directions in the OMEGALINE® manual which pertain to the 9715.

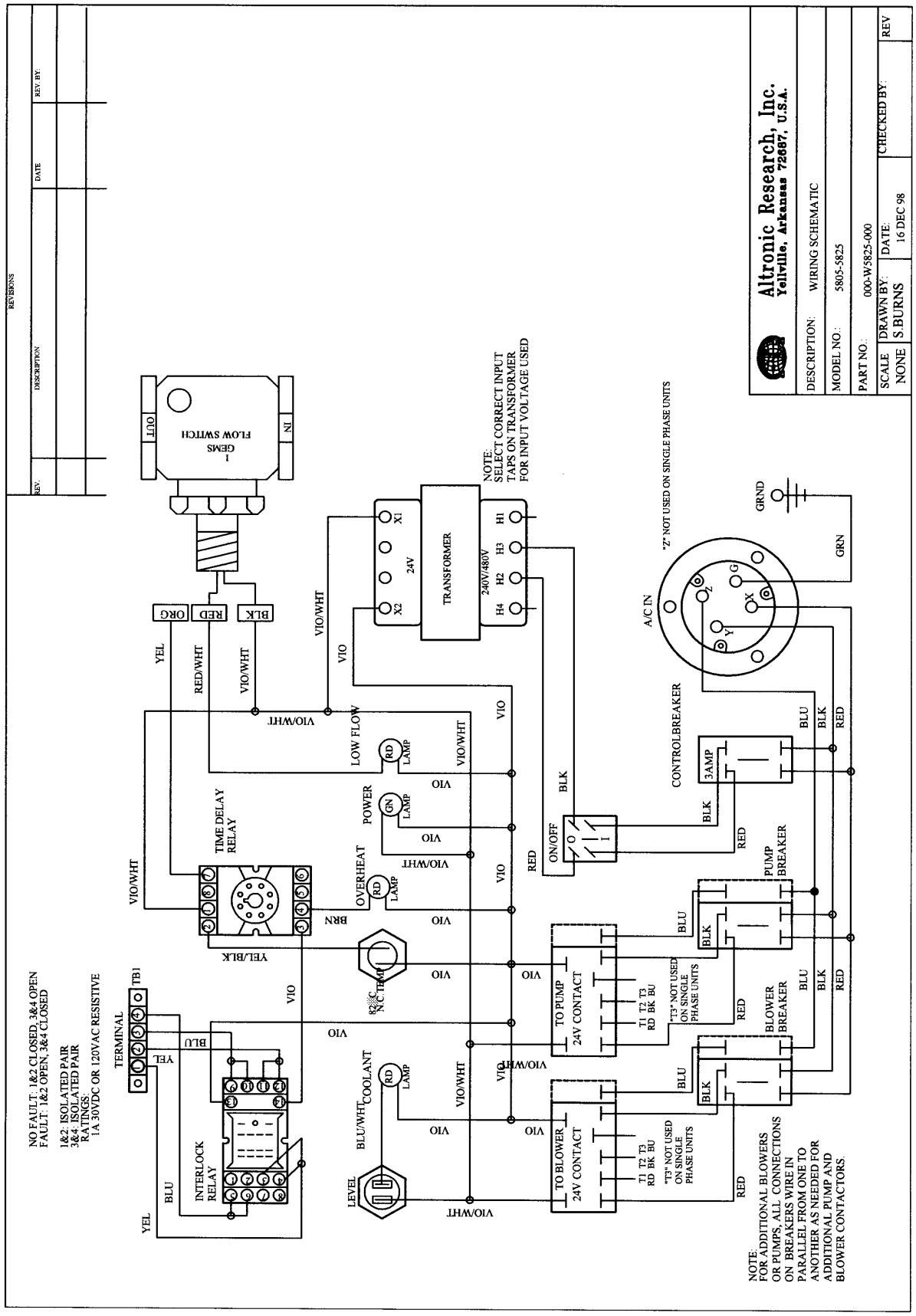
SPECIAL NOTE: After maintenance has been performed on cooling circuit (including resistor replacement), or when there is reason to suspect that the coolant is contaminated, the cooling circuit should be thoroughly flushed with clean water. This should be done by filling the system with clean water and running a short time, then draining and cleaning filter screen. This should be done several times until water is completely clear and filter remains clear of particles. Then refill system with required amount of potable water or approved 35% ethylene glycol mixture.

7-4. Other Repairs. Normal electrical and mechanical skills are required for repair and replacement of pump and fan assembly.

OUTLINE AND DIMENSIONS



SCHEMATIC DIAGRAM



REPLACEMENT PARTS LIST

Model 5810

(CONSULT FACTORY)

SPECIFICATIONS: Model 5810

Impedance ---------- > 50 ohms nominal

Frequency Range ---------- > 60 Hz to 800 MHz

VSWR = 60 Hz to 800 MHz ---------- > 1.1:1 max.

<u>Connectors</u>:

Model 5810E1 ---------- > 1 5/8" Swivel Flange
Model 5810E3 ---------- > 3 1/8" Swivel Flange
Model 5810R3 ---------- > 3 1/8" Unflanged

Cooling Method ---------- > Air over Water-Heat Exchanger
Coolant Liquid Capacity ---------- > Approximately 1.5 gal. (5.68 liters)
Coolant Type ---------- > Potable water or 35% ethylene glycol mixture

Power Rating ---------- > 10 KW Cont.

Ambient Temperature vs. Power Ratings:

<u>10KW continuous</u>:

Potable water only ---------- > +5°C to +40°C (41°F to 104°F)

<u>8KW continuous</u>:

35% Ethylene Glycol ---------- > -20°C to +35°C (-4°F to +95°F)

Fan Assembly ---------- > 3/4 HP Centrifugal
Pump ---------- > 1/2 HP Centrifugal

AC Power Requirements:

230 VAC, Single Phase, 60 Hz ---------- > 9 Amp.

Finish ---------- > Beige Splatter

Serial No._____Frequency_____Resistance_____ dBA@3ft <u>< 80dBA</u>

Model_____Inspected by_____Date_____

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CRAFTED WITH PRIDE IN ARKANSAS, U.S.A.

APPENDIX

COMPONENT MANUFACTURER'S DOCUMENTS