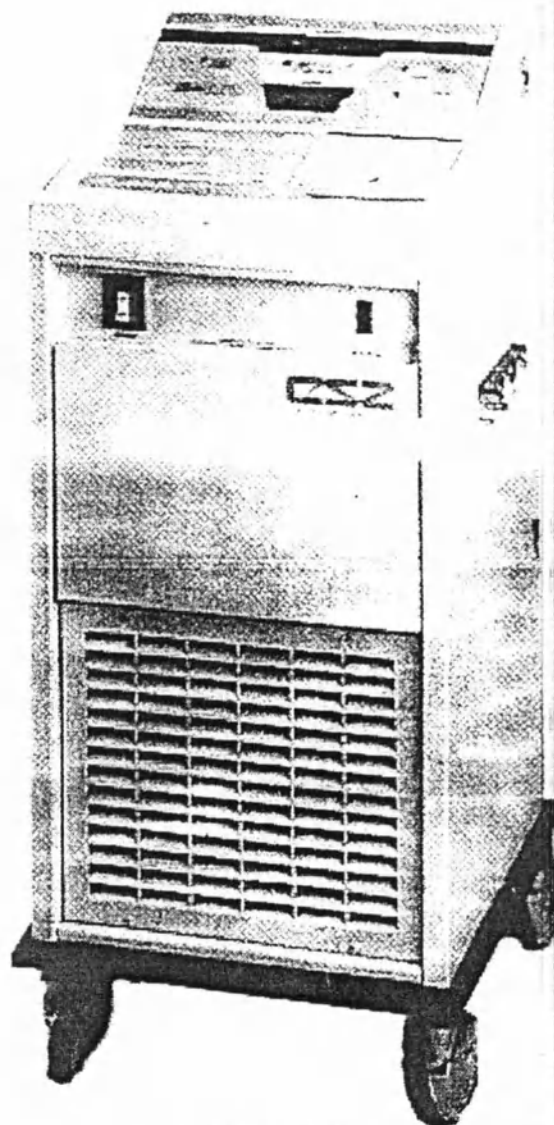


BLANKETROL®

Гипер-гипотермия

Руководство по эксплуатации



Model 222R



Cincinnati Sub-Zero

Value-Designed Technology In Temperature Control

Cincinnati Sub-Zero Products, Inc. • 12011 Mosteller Road • Cincinnati, Ohio 45241, U.S.A.
(513) 772-8810 • FAX#(513) 772-9119 • (800) 989-7373

Symbols



Temperature Set



Stop - Repair



Equipotential Ground



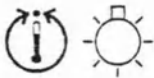
Water Temperature



Increasing Temperature



Silence Alarm



Temp. Set Point Indicator



Decreasing Temperature



Caution: Read
Operation Instructions
and Manual Before
Operating



Patient Temperature



Automatic Control



Manual Control



Risk of Explosion:
Do not use in the
Presence of Flammable
Anesthetics



Disconnect Power
Before Servicing



Change Water
Monthly



Power Cord Holder



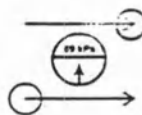
Water Flow Indicator



Fill to Strainer



Danger; Risk of
Electric Shock



Inlet

Outlet



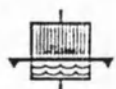
Test Indicators



Monitor Only



Clean
Condenser
Monthly



Clean Water
Filter Quarterly



Type B Equipment

BLANKETROL® II

OPERATION & TECHNICAL MANUAL

The operator must read and understand the **Operation & Technical Manual** in its entirety prior to operating the equipment.

Cincinnati Sub-Zero Products, Inc., reserves the right to make equipment changes and improvements which may not be reflected in this manual.

CAUTION

Federal law restricts this device to use only on the order of a physician.

DANGER

- Notify the physician if the patient's temperature is not responding properly or does not reach the temperature prescribed in the prescribed time or if there is a change in the prescribed temperature range. Failure to inform the physician of the deviation may result in injury to the patient.
- Do not use the BLANKETROL II system in the presence of flammable anesthetics. **Risk of explosion can result.**
- Power interruption will cause the BLANKETROL II to revert to **CHECK SETPOINT** resulting in no therapy to the patient. Follow instructions for desired mode to resume operation. **Failure to resume therapy could result in serious injury or death.**

BLANKETROL®, MAXI-THERM®, MAXI-THERM LITE®, TEMP-PAD®, PLASTI-PAD® and PLASTI-PAD PLUS® are registered trademarks of Cincinnati Sub Zero Products, Inc., Cincinnati, Ohio USA.

Manual 56230 Rev. L
05/01

CAUTION

- Use distilled water only. Failure to use distilled water may result in poor performance and damage to the BLANKETROL® II.
- Do not use De-ionized Water. The majority of de-ionizers do not maintain a neutral pH of 7. If the de-ionized water is acidic, it will cause a battery effect and the copper refrigeration line will begin to deteriorate and cause a leak in the refrigeration system.
- Do not use alcohol. Alcohol may cause blanket deterioration.
- Do not operate without water to avoid damage to internal components.
- Do not overfill. Overfilling may result in overflow when the water in the blanket drains back into the system when the system is turned off.

DANGER

- The repair, calibration, and servicing of the BLANKETROL II should be performed by qualified Medical Equipment Service Technicians, Certified Biomedical Electronics Technicians, or Certified Clinical Engineers familiar with good repair practices for servicing medical devices, and in accordance with instructions contained in this manual. **Improper repair can result in damage to the BLANKETROL II system and patient injury.**

DANGER

Before returning the BLANKETROL II to patient use **after** repairs, the FIRST TIME SET-UP/SYSTEM TEST ROUTINE in Section 2 must **always** be performed. **Improper repair can result in damage to the BLANKETROL II system and patient injury.**

BLANKETROL® II

OPERATION & TECHNICAL MANUAL

The operator must read and understand the **Operation & Technical Manual** in its entirety prior to operating the equipment.

Cincinnati Sub-Zero Products, Inc., reserves the right to make equipment changes and improvements which may not be reflected in this manual.

CAUTION

Federal law restricts this device to use only on the order of a physician.

DANGER

- Notify the physician if the patient's temperature is not responding properly or does not reach the temperature prescribed in the prescribed time or if there is a change in the prescribed temperature range. Failure to inform the physician of the deviation may result in injury to the patient.
- Do not use the BLANKETROL II system in the presence of flammable anesthetics. **Risk of explosion can result.**
- Power interruption will cause the BLANKETROL II to revert to **CHECK SETPOINT** resulting in no therapy to the patient. Follow instructions for desired mode to resume operation. **Failure to resume therapy could result in serious injury or death.**

BLANKETROL®, MAXI-THERM®, MAXI-THERM LITE®, TEMP-PAD®, PLASTI-PAD® and PLASTI-PAD PLUS® are registered trademarks of Cincinnati Sub Zero Products, Inc., Cincinnati, Ohio USA.

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WARNING



- A physician's order is required for setting blanket temperature and use of equipment. At least every 20 minutes, or as directed by physician, check patient's temperature and skin condition of areas in contact with blanket; also, check blanket water temperature. Pediatric, temperature-sensitive, patients with vascular disease, and operating room patients should be checked more frequently. **Notify the physician promptly of any change in patient status in order to avoid serious injury or death.**
- The method of temperature control provided by all hyper-hypothermia units presents the danger of heating or cooling body tissues, particularly the skin, to a point where they are injured, i.e., burns or frostbite, respectively. Depending on the extent and severity of a burn, very serious and even fatal complications may arise.
- Prevent excessive and/or prolonged tissue pressure and shearing forces especially over bony prominences, to prevent skin damage that may result.
- Do not place additional heat sources between the patient and blanket. **Skin damage may result.**
- The area between the patient and the blanket should be kept dry to avoid injury to patient.
- Use only 400 Series, or equivalent, probes on CSZ equipment. **Failure to do this will cause incorrect temperature readings.**

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SECTION 1. INTRODUCTION

1-0. GENERAL SAFETY PRECAUTIONS

To provide the patient maximum safety during the use of the BLANKETROL II hyper-hypothermia system, a thorough knowledge and understanding of the system, and its correct application and operating use are required. Each person who is responsible for use or direction of use of the system, such as physicians, nurses, technicians and operators must read and understand this operating manual and all precautions and warnings prior to use. It is recommended this manual be reviewed at least semi-annually as a refresher to safe operation and application.

1-1. GENERAL DESCRIPTION OF THIS MANUAL

This manual describes the operation, maintenance, and service of the CSZ BLANKETROL II hyper-hypothermia system. Section One describes the physical and functional characteristics of the BLANKETROL II System. Section Two describes how to prepare the BLANKETROL II unit for general use. Section Three describes how to operate the unit in the Manual Control Mode, Automatic Control Mode, and Monitor Only Mode. Section Four describes the regular maintenance of the BLANKETROL II unit. Section Five describes Field Repair and Service of the BLANKETROL II unit. Section Six is a Troubleshooting Guide and Section Seven outlines parts information.

This manual is prepared for professional personnel who use the equipment for patient care. It is also intended for technicians and service personnel who are responsible for maintaining the equipment. A selected part of the information of this manual is presented in a second manual, Operation Manual for the BLANKETROL II System for Hyper-Hypothermia. This second manual is designed to be stored with the BLANKETROL II unit and to be readily available for reference when operating the BLANKETROL II System.

TECHNICAL HELP

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3821 AJ Amersfoort
The Netherlands

Telephone +31-33 455 5507
Fax +31-33 455 0529

BEFORE YOU CALL FOR SERVICE...

To help us better serve you, please have the serial number of your BLANKETROL II unit ready when you call for parts or service.

IN-WARRANTY REPAIR AND PARTS

All parts on your BLANKETROL II unit are covered by a two-year warranty. To return defective parts or units, first obtain a Returned Materials Authorization (RMA) number from our Medical Technical Service department. A BLANKETROL II shipping carton will be sent to you, if needed.

RECEIVING INSPECTION

After unpacking the BLANKETROL II System, be sure to inspect the system for concealed damage. Retain all packing material and carefully describe or photograph any damage. Notify the carrier at once and ask for an inspection (in writing). Failure to do this within 15 days may result in loss of claim. Do not return the equipment to Cincinnati Sub-Zero. Call our Medical Technical Service department for further instructions.

IMPORTANT SAFETY INFORMATION

Refer to this manual for instructions and caregiver information. Read and understand all precautionary information before using, prescribing, or servicing the BLANKETROL II unit.

1-4.1. EXTERNAL FEATURES - FRONT VIEW

The external features in Figure (1-1) of the BLANKETROL II unit are described as follows:

- A. The control panel is composed of pressure sensitive touch switches and four LED displays. An expanded description of the control panel is presented in Section (1-4.4.).
- B. The operating instructions are printed directly below the control panel. This layout is designed to increase the operator's efficient use of the unit.
- C. The power switch is a bevel rocker switch labeled ON at the top and OFF at the bottom. The switch lights up green when ON. A circuit breaker is built-in the switch to protect against overload conditions.
- D. The storage drawer tilts out from the top to provide storage space for items such as probes, connector cables, connecting hoses, the drain hose, and the Operator's Manual.
- E. The grille permits air to be drawn into the unit and pass over the condenser. The air is then discharged through the bottom of the unit. The grille should be kept from being blocked by being cleaned regularly as described in Section (4-4.).
- F. The protective bumper guard surrounds the lower edge of the unit and protects the unit as well as the walls.
- G. Four conductive, swivel casters are specially designed to permit the unit to move easily and to prevent it from tipping.
- H. The Celsius/Fahrenheit selector switch, abbreviated C/F, is a rocker switch that permits the operator to select the measurement scale, Celsius or Fahrenheit, by which the unit functions. Celsius is in the down position and Fahrenheit is in the up position.

NOTE: *The C/F switch is not available on 230V and 240V versions.*

- I. The water fill opening is where the operator pours distilled water to fill the reservoir.

1-2. GENERAL DESCRIPTION OF THE BLANKETROL II SYSTEM

The CSZ BLANKETROL II (Model 222R) Hyper-Hypothermia System is used to lower or to raise a patient's temperature and/or maintain a desired patient temperature through conductive heat transfer. The CSZ BLANKETROL II unit is composed of a heater, a compressor, a circulating pump, and a microprocessor. This unit requires no field adjustments or calibrations in order to maintain the precise measurement of temperature and temperature limits.

Water is heated or cooled and pumped from the unit to a blanket. The blanket* rests under and/or on top of the patient and is designed so that the water circulates through the blanket and returns to the unit.

If cooled water is circulated through the blanket, the desired effect is to reduce the patient's temperature. If warmed water is circulated through the blanket, the desired effect is to elevate the patient's temperature.

The BLANKETROL II unit can be set so that it operates based on the temperature of the circulating water (Manual Control) or it can be set so that it operates based on the temperature of the patient (Automatic Control).

* The recommended blanket(s) for use is described in Section (1-5.)

1-3. CLINICAL APPLICATIONS

The BLANKETROL II unit is used primarily in hospital Intensive and Coronary Care Units, in Operating, Recovery and Emergency Rooms, in Burn Units, and on Medical/Surgical floors. This hyper-hypothermia system can be used with adult and pediatric patients to produce normothermia by lowering a patient's elevated temperature or raising a patient's sub-normal temperature. It can also be utilized to maintain normal body temperature (normothermia) during surgical procedures.

Surgically, this system can be used to produce moderate to profound hypothermia for such procedures as amputations, cardiopulmonary by-pass surgery, vascular surgery, and intracranial surgery. Medically this system can be used to decrease the rate of circulation, to reduce intracranial pressure, to control cerebral edema, and to reduce oxygen requirements. This system is also used in the treatment of burns, shock, cardiac arrest, and gastrointestinal hemorrhage.

1-4. PHYSICAL DESCRIPTION OF THE BLANKETROL II UNIT

The BLANKETROL II unit is a compact unit with the following physical aspects:

Dimensions:	17 inches Wide x 17 inches Deep x 36" High
Weight:	131 pounds (59.5 kg.)
Cabinet Construction:	Powder coated steel with plastic top. Dual compartment reservoir. Bottom air discharge. Built-in handle. Bumper guards. Storage compartment. Four 4 inch conductive, swivel type casters.

1-4.2. EXTERNAL FEATURES - RIGHT SIDE VIEW

The external features in Figure (1-2) of the BLANKETROL II unit are described as follows:

- A. The water flow indicator is a paddle-wheel immersed in the path of the circulating water with a window to the outside. As water is circulated through the system, it must pass over the paddle-wheel causing it to spin (like a pinwheel). The water flow indicator provides a visual display of the general rate at which the water is circulating. For example, if the unit is circulating water but the connecting hose is pinched, the circulation of the water is restricted. The change in water flow decreases the speed of the paddle-wheel.

When the problem of the pinched connecting hose is solved, an increase in water flow can be seen by watching the water flow indicator increase in speed. A total obstruction of the water path will cause the paddle-wheel to stop completely.

- B. The recessed handle permits the operator to grip the unit when moving it.
- C. The four capped screws on the right and left side of the unit secure the top to the base.
- D. The patient probe jack is where the 400 Series probe is connected to the unit. Only one patient probe can be connected at a time.
- E. Three female, quick-disconnect return couplings on the top row are designed for water to flow in when the male coupling of the connecting hose is attached.
- F. The three male quick-disconnect outlet couplings on the bottom row are designed for water to flow out when the female coupling of the connecting hose is attached.
- G. The power cord with a hospital-grade 3-prong plug should only be inserted into a properly grounded hospital grade receptacle for 100/115 VAC units and 230/240 VAC units. Electrical Specifications are described in Section (1-7.).

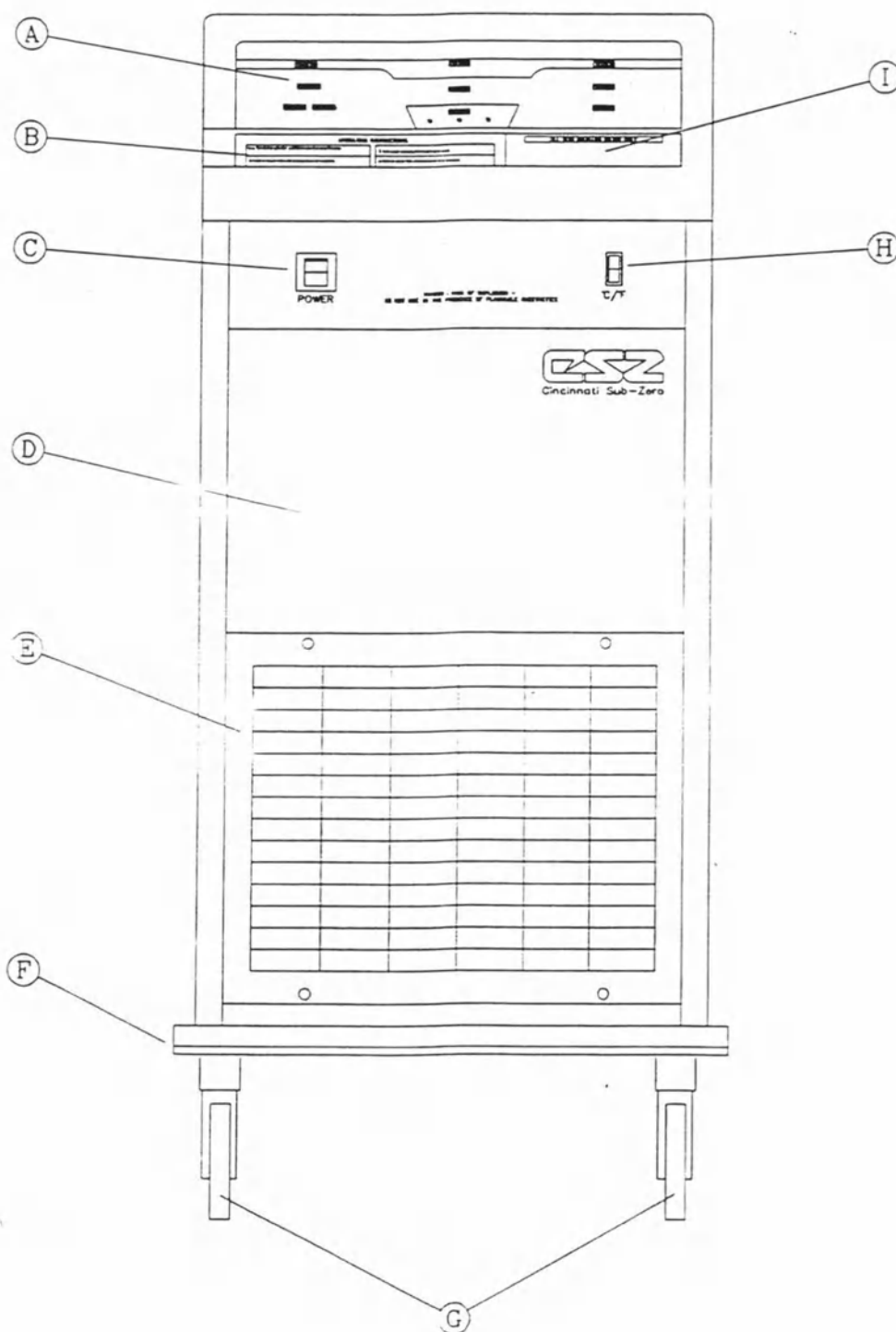


FIGURE 1-1. BLANKETROL II, FRONT VIEW

1-4.3. EXTERNAL FEATURES - REAR VIEW

The external features in Figure (1-3) of the BLANKETROL II unit are described as follows:

- A. The specification label outlines the BLANKETROL II unit's electrical requirements.
- B. The maintenance label outlines the periodic checks for the BLANKETROL II unit.
- C. Two air vents provide air circulation for the microprocessor.
- D. The nylon strap is used to secure and store the coiled power cord when not in use.
- E. The rear enclosure panel secured with four screws provides access to the interior. The panel is removed to perform maintenance, repair, or replacement of components.
- F. The serial number label is permanently attached and located along the bottom of the unit on top of the bumper guard.

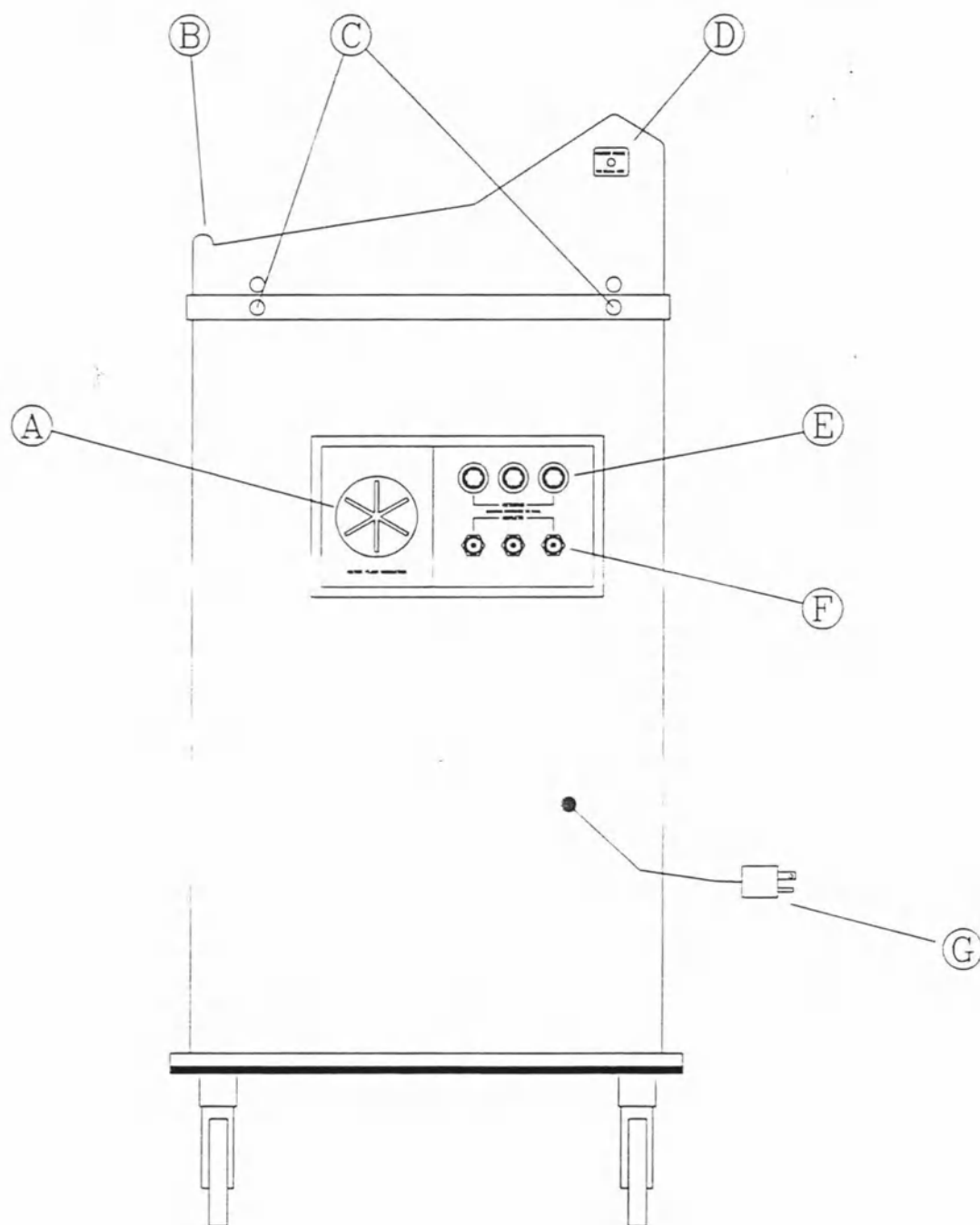


FIGURE 1-2 BLANKETROL II, RIGHT SIDE VIEW

1-4.4. EXPANDED DESCRIPTION OF THE BLANKETROL II CONTROL PANEL

The control panel as shown in Figure 1-4.A for 100/115 Volt and 1-4.B for 230/240 Volt is composed of pressure sensitive touch switches and LED displays.

The control panel is divided into the following Sections:

- A. The amber digital display labeled BLANKET/WATER shows the actual temperature of the circulating water.
- B. The MANUAL CONTROL touch switch is used to activate the unit so that operation is based on the temperature of the circulating water relative to the Setpoint temperature.
- C. The amber digital display labeled SETPOINT shows the desired temperature of the water or the patient as set by the operator.
- D. The TEMP SET switch and the Up and Down arrow switches are used to set the Setpoint display. The amber arrow on the left of the Setpoint display, the amber arrow on the right of the Setpoint display, the Celsius indicator, and the Fahrenheit indicator are only visible under specific conditions. When visible, each indicator acts as a guide for the operator.
- E. The amber digital display, labeled PATIENT, shows the actual temperature of the patient.
- F. The AUTO CONTROL switch is used to activate the unit so that operation is based on the temperature of the patient relative to the Setpoint temperature.
- G. The two switches labeled TEST INDICATORS and SILENCE ALARM are used to confirm that all the indicators on the control panel are working and to silence the alarm in certain conditions.
- H. The display labeled STATUS reports the status of the unit and/or indicates changes that the operator should make. The possible status displays are listed in Section (3-8.). Below the Status display are the three LEDs colored amber, green, and amber that light up depending on whether the unit is cooling, at setpoint, or heating.
- I. A REMOVE FROM SERVICE indicator is located below the LED and is visible only if the unit malfunctions in a manner that could be dangerous to the patient and is not Operator Correctable.
- J. The MONITOR ONLY switch is used to set the unit to monitor the temperature of the patient without heating, cooling or circulating the water.

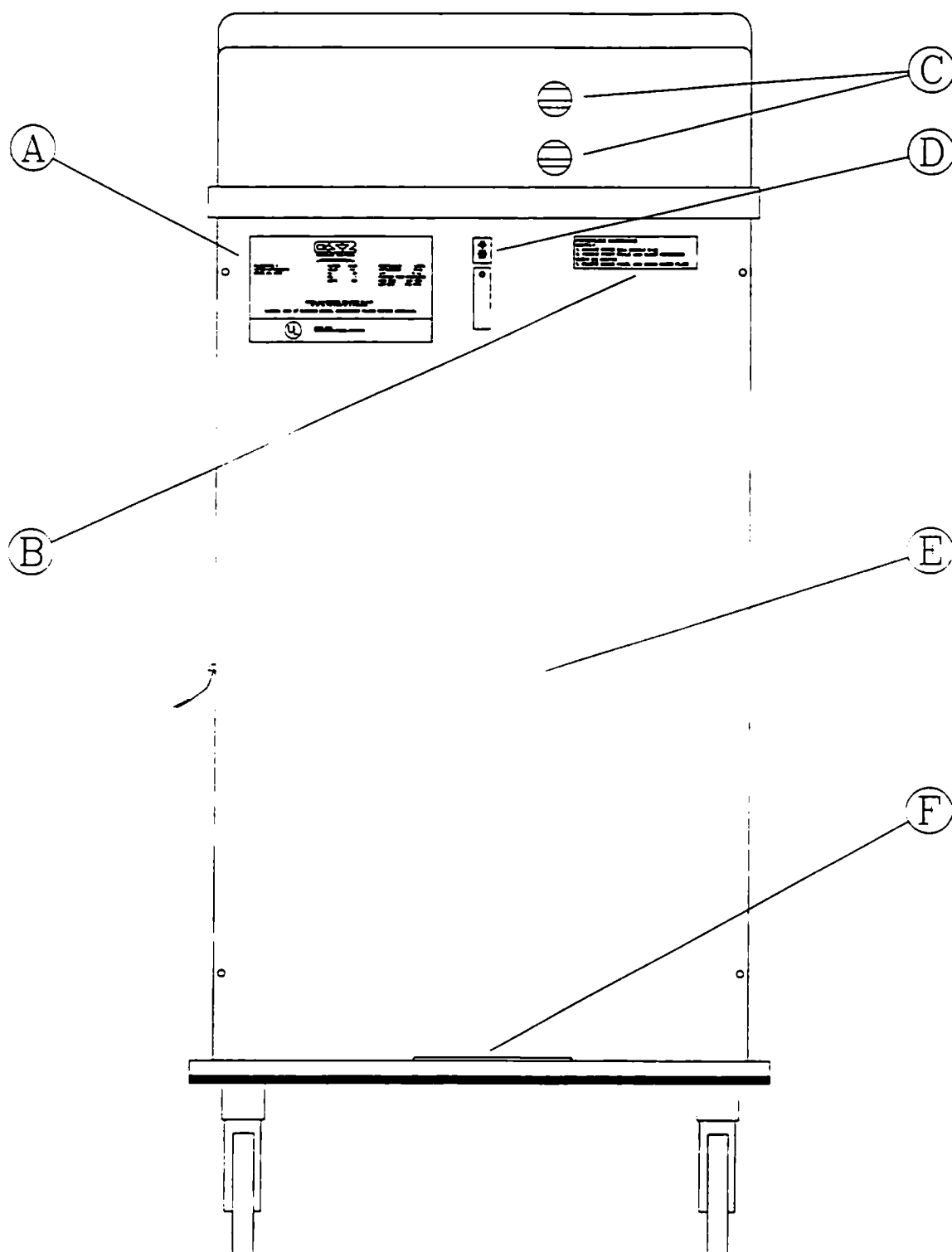


FIGURE 1-3, BLANKETROL II, REAR VIEW

1-5. REQUIRED ACCESSORIES

Operation of the BLANKETROL II unit requires the use of the blanket(s) designed to circulate warm or cool distilled water, a connecting hose with quick-disconnect male and female couplings, and a 400 Series thermistor probe (if Automatic Control Mode is to be utilized). BLANKETROL II System Equipment and accessories are listed in Section Seven.

CSZ offers the widest selection of hyper-hypothermia blankets to serve your needs providing both reusable and single-patient use blankets. The reusable blanket, the lightweight PLASTIPAD comes with an integral nine foot extension hose with quick-disconnect, error proof male and female couplings. Additionally, the reusable PLASTI-PAD PLUS pressure relieving/hyper-hypothermia blanket and connecting hose is available. Single-patient use blankets, TEMP-PAD, MAXI-THERM, MAXI-THERM LITE and a reusable connecting hose are also available. All CSZ blankets offer significantly higher thermal transfer capability than any other brand of hyper-hypothermia blankets.

CSZ also offers a disposable blanket cover, the DISPOSABLE COVER, that eliminates stains, helps prevent cross-contamination, enhances patient comfort, provides moisture barrier, saves on nursing time, and offers greater economy because it prolongs blanket life and reduces laundry costs.

Only 400 Series probes, REUSABLE or SINGLE-PATIENT use, should be used with the BLANKETROL II unit. If a SINGLE-PATIENT probe is used, a REUSABLE CONNECTOR-CABLE is required in order to connect the disposable probe to the unit. The type of probe may be a rectal/esophageal or skin surface probe.

Operation of the BLANKETROL II unit requires the use of distilled water.

NOTE: DO NOT USE DE-IONIZED WATER.

Draining the BLANKETROL II unit requires the use of a drain hose with a female coupling. This hose is included in the packaging of the unit and can be retained in the storage compartment of the unit.

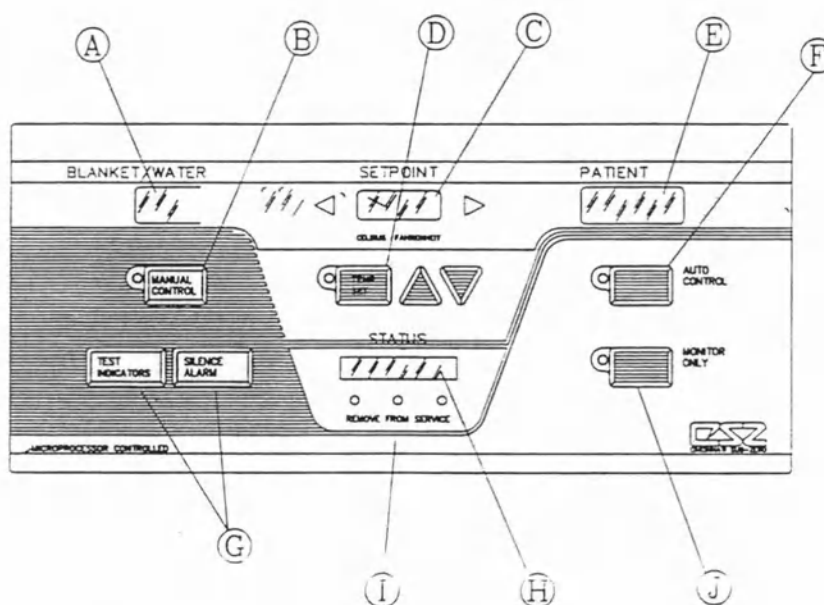


FIGURE 1-4.A., BLANKETROL II, CONTROL PANEL, 115 VAC UNITS

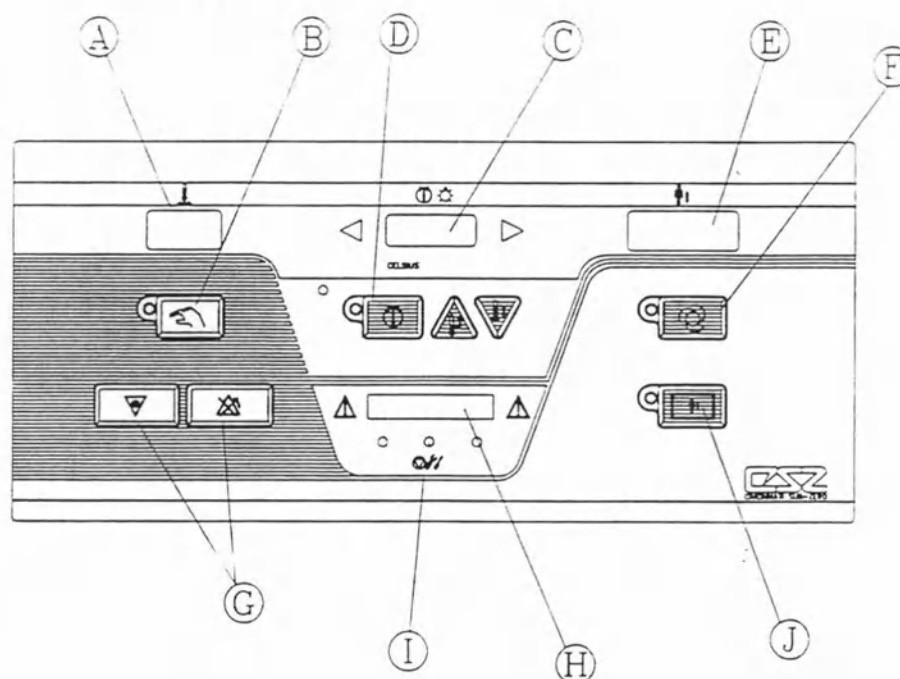


FIGURE 1-4.B., BLANKETROL II, CONTROL PANEL, 230-240 VAC UNITS

1-6.2. COOLING SYSTEM

The BLANKETROL II cooling system is composed of a compressor, condenser, condenser fan, an evaporator coil, water temperature control, solenoid valve, hot gas bypass valve, and three low temperature safety devices. Temperature ranges are described in Section (1-6.4.).

The refrigerant of the cooling system flows through the evaporator coil located in the circulating reservoir. The water circulating in the reservoir flows over the evaporator coil and is cooled.

The cooling system is operational in the Manual Control or Automatic Control Modes whenever the control system calls for a decrease in the temperature of the circulating water. It is important to note that the rate of change in the circulating water temperature is not directly proportional to the rate of change in the temperature of the patient.

1-6.3. CIRCULATING SYSTEM

The BLANKETROL II circulating water system is composed of a magnetically driven circulating pump, a dual compartment reservoir, a water filter, quick-disconnect fittings, connecting hose, and hyper-hypothermia blanket(s).

The 2 gallon (7.5 liters) capacity dual compartment reservoir is composed of the circulating reservoir situated under and connected to the replenishing reservoir. When the operator fills the reservoir with distilled water, the circulating reservoir fills first and holds approximately $\frac{1}{2}$ gallon (1.9 liters) of water. The remaining $1\frac{1}{2}$ gallons (5.6 liters) are held in the replenishing reservoir. The water moves from the replenishing reservoir to the circulating reservoir by gravitational pull as needed.

The circulating water flows over and around the heating/cooling element located in the circulating reservoir. The heated or cooled water then flows out the reservoir to the circulating pump, through the pump housing, through connecting hoses over a water temperature sensor to the hyper-hypothermia blanket(s). The water circulates through the blanket(s) and returns to the unit. The water then passes through the water flow indicator, through the water filter and returns to the circulating reservoir to be reheated or re-cooled and then recycled.

In addition, the circulating reservoir contains a low water level sensor which shuts down the unit and sounds the alarm if the water level drops below a preset amount. The unit becomes operational only after the water level is restored to normal.

NOTE: DO NOT USE DE-IONIZED WATER.

1-6. FUNCTIONAL DESCRIPTION OF THE BLANKETROL II SYSTEM

In the Manual Control Mode, the operator sets the desired temperature of the circulating water. The unit either heats or cools the water to reach the desired setpoint temperature. The water circulates through the blanket and either raises or lowers the temperature of the patient. In this case, the patient's temperature must be closely monitored. There is no constant relationship between the temperature of the circulating fluid and the temperature of the patient or the change in temperature of the patient.

In the Automatic Control Mode, the operator sets the desired temperature of the patient. In addition, the operator must attach a 400 Series probe in or to the patient. The probe is then inserted into the BLANKETROL II unit. The probe is used to measure the actual temperature of the patient and this measurement is then compared with the desired Setpoint temperature by the unit's microprocessor. If the actual patient temperature is lower than the desired patient temperature, the BLANKETROL II unit heats the circulating water so that the temperature of the patient is elevated to reach the desired Setpoint. At Setpoint, the unit continues to circulate the water but the heater ceases to operate. When the patient's temperature falls outside the Setpoint range, the heater/compressor resumes operation, heating/cooling the water until the patient's temperature is once again at Setpoint.

If the actual temperature is higher than the desired patient temperature, the BLANKETROL II unit cools the circulating water so that the temperature of the patient decreases to the desired Setpoint temperature. At Setpoint, the unit continues to circulate the water, but the compressor stops. When the patient's temperature falls outside the Setpoint range, the compressor/heater resumes operation, cooling/heating the water until the patient's temperature is once again at Setpoint.

In addition, the BLANKETROL II unit can be set to operate in a Monitor Only Mode. In this mode, the 400 Series probe is attached to or inserted into the patient and is connected to the unit. The operator then sets the BLANKETROL II unit to monitor and display the patient's actual temperature. In this mode, the unit does not heat, cool, or circulate the water.

1-6.1. HEATING SYSTEM

The BLANKETROL II heating system consists of an immersion heater, water temperature control, and three high temperature safety devices. Temperature ranges are described in Section (1-6.4.). The immersion heater is located in the circulating reservoir. The water circulating in the reservoir flows around the immersion heater and is warmed.

The heating system is operational in the Manual Control or Automatic Control Modes whenever the control system calls for an increase in the temperature of the circulating water. It is important to note that the rate of change in the circulating water temperature is not directly proportional to the rate of change in the temperature of the patient.

1-7. SPECIFICATIONS OF THE BLANKETROL II UNIT

BLANKETROL II MODEL 222 FEATURES

PHYSICAL	SAFETY SYSTEM
Dimensions: 17"W x 17"D x 37.5"H (43.18cm.W x 43.18 cm. D x 95.25cm.H) Weight: 131 lbs. (59.5kg.) Cabinet Construction: Epoxy-coated steel with plastic top. Dual reservoir. Bottom air discharge. Built-in handle. Bumper guard. Storage Compartment. Four 4" conductive, 360° swivel-type casters.	Maximum High Control Setting: 107.6°F (42°C) Primary Safety: 112°F ± 4°F (44.6°C ± 2°C) Secondary Safety: 115°F ± 4°F (46°C ± 2°C) Maximum Low Control Setting: 39.2°F (4°C)
THERMAL SYSTEM	Primary Safety: 38°F ± 2°F (3°C ± 1°C) Secondary Safety: 34°F ± 2°F (1°C ± 1°C) Defective or Dislodged Probe Alarm: Audible & Visual
Compressor: 1/3 HP (Copeland) Heater: 800 Watts NOTE: Water cooling rate is approximately 8°F (4°C) per minute and the heating rate is approximately 6°F (3°C) per minute.	Primary & Secondary High and Secondary Low Limit Failure Alarm: Audible & Visual Low Water Alarm: Audible & Visual
CIRCULATING SYSTEM	Defective Water Temp Sensor: Audible & Visual Water Flow Indicator: Visual Optional: Low Flow Alarm Kit Audible & Visual RS232 Interface
Dual Compartment Reservoirs, 2 gallon (7½ liters) total capacity. Error proof, quick-disconnect couplings. All circulating components are non- corrosive.	
ELECTRICAL SYSTEM	
Electrical Characteristics: 115V, 60Hz., 10.2 Amps (Opt.) 100V, 50/60Hz., 11.6 Amps (Opt.) 230V, 50Hz., 5.2 Amps (Opt.) 240V, 50Hz., 5 Amps Power Cord: 14/3 SJT (100/115V), Hospital grade plug HO5VV-F3G1.0 (230/240V) Leakage Current: Under 300 µa 100/115 Under 500 µa 230/240 Circuit Breaker: In Power Switch	

1-6.4. TEMPERATURE SAFETY CONTROL SYSTEM

The BLANKETROL II unit is designed to carefully measure and control the temperature of the circulating water. The unit is engineered so that when the temperature of the circulating water reaches the desired setpoint temperature, the unit operates between heating and cooling the water in order to maintain the setpoint temperature. The unit is designed not to exceed or fall below the desired temperature.

As a safety precaution, the BLANKETROL II unit has three high temperature safety devices and three low temperature safety devices.

Each safety device continuously monitors the temperature of the circulating water and almost any possible failure is protected by a back-up system. As an additional precaution, if the water temperature sensor itself should fail, the unit shuts down and indicates REMOVE FROM SERVICE (Sensor). With this safety design, both the patient and the unit are protected from injury or damage caused by extreme temperatures.

At the same time, the operator must regularly monitor the patient whenever hyper-hypothermia therapy is used.

SAFETY CONTROLS FOR PROTECTION FROM HIGH TEMPERATURE

Circulating water reaches $107.6^{\circ}\text{F} \pm 1^{\circ}\text{F}$ ($42^{\circ}\text{C} \pm .5^{\circ}\text{C}$), microprocessor controls setpoint.

Circulating water reaches $112^{\circ}\text{F} \pm 4^{\circ}\text{F}$ ($44.6^{\circ}\text{C} \pm 2^{\circ}\text{C}$), safety device shuts off heater, status display flashes "HI TEMP" and the microprocessor board beeper is sounded.

Circulating water reaches $115^{\circ}\text{F} \pm 4^{\circ}\text{F}$ ($46^{\circ}\text{C} \pm 2^{\circ}\text{C}$), back-up safety device shuts off the unit and indicates REMOVE FROM SERVICE AND HI LIMIT.

SAFETY CONTROLS FOR PROTECTION FROM LOW TEMPERATURE

Circulating water reaches $39.2^{\circ}\text{F} \pm 1^{\circ}\text{F}$ ($4^{\circ}\text{C} \pm .5^{\circ}\text{C}$), microprocessor controls setpoint.

Circulating water reaches $38^{\circ}\text{F} \pm 2^{\circ}\text{F}$ ($3^{\circ}\text{C} \pm 1^{\circ}\text{C}$), microprocessor shuts off cooling solenoid and indicates "LOW TEMP."

Circulating water reaches $34^{\circ}\text{F} \pm 2^{\circ}\text{F}$ ($1^{\circ}\text{C} \pm 1^{\circ}\text{C}$), back-up safety device shuts off the unit and indicates REMOVE FROM SERVICE AND LOW LIMIT.

SECTION 2. GENERAL PREPARATION OF THE BLANKETROL II SYSTEM

2-1. INTRODUCTION

This section describes the procedures to prepare the BLANKETROL II unit for general use. This entails unpacking the shipment, arranging all the equipment for the first time, and completing a test routine. This section also outlines the bacteriocidal agent preparations, standard safety precautions, and patient preparation/bedside care when using the hyper-hypothermia blanket(s).

2-2. UNPACKING THE SHIPMENT

Cut the band at the bottom of the carton. Lift off the cardboard box and lift the unit from the foam insert. Locate and remove the envelope containing the manual and warranty card. Be sure to complete and return the warranty card.

During the unpacking process, look carefully for signs of shipping damage. If any unacceptable damage is found, notify the transportation company immediately and file a claim. The transportation company is responsible for the shipment after it leaves the factory. If problems other than shipping damage are found, notify your Cincinnati Sub-Zero representative or the Factory.

2-3. FIRST TIME SET-UP/SYSTEM TEST ROUTINE

This section describes the tasks necessary to inspect and arrange the equipment for the first time after unpacking and describes a System Test Routine to check out the control panel.

The System Test Routine can also be used to teach operators unfamiliar with the equipment how to use the unit.

1-7. SPECIFICATIONS OF THE BLANKETROL II UNIT

BLANKETROL II MODEL 222 FEATURES

CONTROL SYSTEM Microprocessor controlled, Lighted "OFF-ON" switch, °C or °F Switch, Digital LED Read Outs, 6 Alarm Indications, 4 Mode Indications. Controller Range: Water Temp.: 39.2°F to 107.6°F (4°C to 42°C) Patient Temp.: 86°F to 110°F (30°C to 43.5°C) Display Accuracy: Water Temp. ± 1°F (± .5°C) Patient Temp. ± .5°F (± .25°C)	Display Range: Water Temp. 32°F - 122°F (0°C - 50°C) Patient Temp. 50°F - 110°F (10°C - 43.5°C) Display Type: Amber LED Temp. Settings: Water Temp.: 2°F (1°C) Patient Temp.: 2°F (1°C) Patient Probe Jacks: One Probe Type: Series 400 WARRANTY 2 yr. parts
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1-7. BLANKETROL II CERTIFICATIONS



0344 In compliance with the Medical Device Directive (93/42/EEC)



LISTED 350N
REFRIGERATED MEDICAL EQUIPMENT



NRTL/C

STANDARD (NORME) C22.2 NO. 125 RISK CLASS (CATEGORIE DE RISQUES) NO.
2G TESTED BY CSA TO UNDERWRITERS LABORATORIES, INC. STANDARD UL 544

To attach the couplings:

1. grasp the female coupling of the connecting hose
 2. slide the collar back towards the hose
 3. push the female coupling over a male coupling of the unit
 4. allow the collar to SNAP into place and return to its original position
 5. gently pull on the connecting hose to assure a positive connection
 6. next, push back the collar of a female return hose on the unit with one hand
 7. with the other hand, insert the male coupling of the connecting hose
 8. release the collar of the female return coupling
 9. push the male coupling until it SNAPS into position
 10. gently pull the connecting hose to assure a positive connection
- I. Check that the blanket is laying flat and that the connecting hose to the unit is not twisted or pinched.
- J. Check that the power switch of the unit is OFF.
- K. Insert the 3-prong plug for 100/115 VAC units (appropriate ground plug for 230/240 VAC units) into a properly grounded hospital grade receptacle.

**WARNING**

DO NOT BY-PASS THE GROUND PLUG. ELECTRICAL HAZARDS MAY RESULT.

2-3.2. COMPLETING A SYSTEM TEST ROUTINE

After arranging the equipment described in Section (2-3.1.), complete this System Test Routine which describes what switches to press and the changes to observe.

- A. Make sure that the power switch is in the "ON" position.
1. The switch lights up green.
 2. The microprocessor board goes through self-test.
 3. The status display in the center of the control panel flashes CK SET PT.

If any of the above are not observed, consult the Troubleshooting Guide in Section 5-22.
If they are observed, continue with the test routine.

2-3.1. INSPECTING AND ARRANGING THE EQUIPMENT

- A. Place the BLANKETROL II unit in an uncluttered work space that is accessible to the correct power source and meets acceptable ambient temperature specifications. Position the unit so that the control panel faces the operator.
- B. If the unit was shipped on its side, permit the unit to rest in an upright position before operating due to refrigeration oil displacement.
- C. Visually inspect the BLANKETROL II unit to determine that there are no missing parts, unusual dents, or punctures.
- D. Examine the power cord for cuts or exposed wires and the power plug (3-prong for 100/115 VAC units, appropriate plug for 230/240 VAC units) for bent or missing prongs.
- E. Review Section (1-4.) to identify the features of the BLANKETROL II unit.
- F. Collect and arrange the following equipment and supplies:
 - 1. Hyper-hypothermia blanket(s) described in Section (1-5.)
 - 2. Connecting hose with quick-disconnect fittings if using disposable blanket(s)
 - 3. Distilled water. DO NOT USE ALCOHOL or DE-IONIZED WATER. The reservoir holds approximately 2 gallons (7½ liters).
- G. Lift the lid of the water fill opening and gradually pour approximately 2 gallons (7½ liters) of distilled water into the reservoir. Stop pouring when the water reaches the strainer visible at the bottom of the water fill opening.
- H. Connect the blanket(s) to the BLANKETROL II unit by attaching the quick-disconnect female coupling of the connecting hose to a male outlet coupling (on the bottom row) of the unit. Attach the male quick-disconnect coupling of the connecting hose to a female return coupling (on the top row) of the unit. Each blanket must be connected to one outlet and one return.

IN ORDER TO CHANGE FROM ONE MODE TO ANOTHER, THE TEMP SET SWITCH MUST BE PRESSED BEFORE THE NEXT MODE CAN BE SET. For example; to change from Monitor Only Mode to Manual Control Mode, the Temp Set switch must be pressed first before the Manual Control Mode switch can be pressed.

G. Press the MANUAL CONTROL switch.

1. The microprocessor board beeps.
2. The LED in the corner of the switch lights up.
3. The Celsius/Fahrenheit indicator is lit.
4. The Setpoint display shows a temperature reading.
5. The Blanket/Water display shows the temperature of the water in the reservoir.
6. The amber arrow (left of the Setpoint display) lights up.
7. The Status display shows COOLING, AT SET PT or HEATING, depending upon the relationship of the water in the reservoir to the Setpoint.
8. A LED corresponding to the Status display lights up amber (left) for COOLING, green (center) for AT SETPT, or amber (right) for HEATING.
9. The pump is activated.
10. The heater or compressor may be activated.
11. The Water Flow indicator on the right side panel begins to move. The water moves from the unit through the blanket and returns to the unit.

If in the process of filling the blankets the water is no longer visible in the bottom of the water fill opening, more distilled water should be added.

If at any time the water falls below a preset limit, the Low Water sensor is activated and the Status display flashes LO WATER and the alarm sounds. The unit shuts down and the operator cannot proceed until this is corrected.

- H. Check the blanket for leaks. If a leak is found, the blanket cannot be used. The repair of reusable blankets is described in Sec (4-6)
- I. Check the couplings at the unit and at the blanket for positive connection.
- J. Press the TEMP SET switch
1. The microprocessor board beeps.
 2. The LED in the corner of the switch lights up.
 3. The amber arrow left of the Setpoint display goes out.
 4. The Blanket/Water display goes blank.
 5. The Celsius/Fahrenheit indicator is lit.
 6. The Status display shows SET TEMP.
 7. The pump shuts down, the heating/cooling stops.

- B. Press and hold the TEST INDICATOR switch.
1. The amber arrows, the LED's in the corner of the switches, the Celsius/Fahrenheit indicator, and the Remove From Service indicator flash on and then off.
 2. Then, all the displays flash.

The operator should note that all the displays and indicators do light up. If they do not light up, consult the Troubleshooting Guide in Section 5-22. If they do light up, continue with the test routine. The Status display continues to flash CK SET PT.

- C. Press the TEMP SET switch.
1. The microprocessor board beeps.
 2. The LED in the corner of the switch lights up.
 3. The Status display shows SET TEMP.
 4. The Setpoint display shows 37°C or 98.6°F (depending upon the position of the Celsius/Fahrenheit indicator switch - 100/115V only). Each time the operator presses the TEMP SET switch after just having plugged in the unit, the Setpoint display shows 37°C or 98.6°F.
- D. Change the position of the Celsius/Fahrenheit Selector switch (on the front of the unit).
1. The Setpoint display changes from 37°C to 98.6°F (or from 98.6°F to 37°C).
 2. The Celsius/Fahrenheit indicator changes from Celsius to Fahrenheit (or from Fahrenheit to Celsius).
- E. Press the MONITOR ONLY switch.
1. The microprocessor board beeps.
 2. The LED in the corner of the switch lights up.
 3. Celsius/Fahrenheit indicator is lit.
 4. The Status display shows MONITOR.
 5. The Setpoint display is blank.
 6. For this test routine, the Patient display is blank because the probe is not inserted in the probe jack.
- F. Press the TEMP SET switch.
1. The microprocessor board beeps.
 2. The LED in the corner of the switch lights up.
 3. The Celsius/Fahrenheit indicator is lit.
 4. The Setpoint display shows 37°C or 98.6°F.
 5. The Status display shows SET TEMP.

P. Press the SILENCE ALARM switch.

1. The alarm stops
2. The Status display continues to flash CK PROBE

The Operator has 5 minutes to correct the problem. In an actual situation, the operator would check the probe and then continue operation.

Q. Press the TEMP SET switch.

1. The microprocessor board beeps.
2. The LED in the corner of the switch lights up.
3. The Setpoint display shows a temperature reading.
4. The Status display shows SET TEMP.

R. Press the Up arrow or the Down arrow so that the Setpoint display shows a number less than 30°C (86°F) or greater than 40°C (104°F). For example, set the display to show 41°C or 106°F.

S. Press the AUTO CONTROL switch.

1. The Setpoint display goes blank.
2. The Status display flashes CK SET PT.

The display flashes because the Setpoint temperature is outside the Automatic Control Mode temperature range of 30°C - 40°C (86°F - 104°F). The unit will not operate in Automatic Control Mode unless the Setpoint display shows a number within the range.

T. Press the TEMP SET switch

1. The microprocessor board beeps.
2. The LED in the corner of the switch lights up.
3. The Setpoint display shows a temperature reading.
4. The Status display shows SET TEMP.

- U. Press the MANUAL CONTROL switch.
1. The microprocessor board beeps.
 2. The LED in the corner of the switch lights up.
 3. The arrow left of the Setpoint display lights up.
 4. The Celsius/Fahrenheit indicator is lit (100/115V only).
 5. The Blanket/Water display shows the temperature of the water in the reservoir.
 6. The Patient display shows the temperature reading of the probe, as it is held by the operator, if the probe reading is in the range of 10°C - 43.5°C (50°F - 110°F).
 7. The Setpoint display shows a temperature reading.
 8. The Status display shows COOLING, AT SET PT, or HEATING depending upon the relationship of the water in the reservoir to the Setpoint.
 9. A LED corresponding to the Status display lights up: amber (left) for COOLING, green (center) for AT SET PT, or amber (right) for HEATING.
 10. The pump is activated.
 11. The heater or compressor may be activated.
 12. The water flow indicator on the right side panel begins to move.

This step is included to show that the patient display lights up when the probe is inserted and the unit is in the Manual Control Mode as well as when the unit operates in the Automatic Control Mode.

- V. To complete this test routine, turn the power switch OFF.

1. The control panel goes blank.
2. The green light of the power switch goes out.

If the power switch is set to the "ON" position again without having unplugged the unit and the Temp Set switch is pressed; the Setpoint display shows the temperature that was on the display prior to the operator turning the unit off.

- W. Remove the probe from the probe jack, loosely coil it and place it in the storage drawer in front of the unit. Reusable probes must be cleaned per Section 4-7 before storage if it has been utilized.
- X. Disconnect the power cord from the power source, loosely coil it and attach it to the back panel using the nylon strap.
- Y. For reusable - PLASTIPAD - blankets, disconnect the connecting hose from the unit. Loosely coil the hose lengthwise in the center of the blanket. Fold the blanket lengthwise into the center, 1/3 from the left side and 1/3 from the right side. The water can remain in the blanket and in the unit between periods of use.

For single-use blankets, MAXI-THERM and TEMP-PAD Blankets, follow the instructions packaged with the blanket. The water should be changed monthly as described in Section (4-2.).

The BLANKETROL II unit, connecting hose, blanket(s), and probe are now ready for patient use.

2-4. UNIT AND PATIENT RELATED PRECAUTIONS

This unit requires both water and electricity to operate.



WARNING



ANY TIME WATER IS FOUND LEAKING INTO OR AROUND THE UNIT, CONNECTING HOSE, AND/OR BLANKET, TURN THE UNIT OFF, DISCONNECT THE POWER CORD FROM ITS POWER SOURCE, AND CORRECT THE PROBLEM BEFORE PROCEEDING.

CAUTION

EXERCISE EXTREME CAUTION IF THE UNIT IS USED FOR PATIENTS WHO ARE ELECTRICALLY SUSCEPTIBLE (PROBE, CATHETER, OR ELECTRODES DIRECTLY CONNECTED TO THE HEART).

- A. Test for leakage current prior to general floor use. See Section (5-18).
- B. Any time a repair is made, make sure that the power cord is disconnected from the power source before disassembly.
- C. The repair and servicing of the BLANKETROL II unit as described in Section (5.) requires no special tools. However, only persons with the proper skills and knowledge should undertake any repairs, servicing or maintenance of the unit.
- D. The high and low temperature safety devices protect the patient and the unit from injury or damage that can be caused by temperature extremes. At the same time, a patient should be monitored closely when hyper-hypothermia treatment is used.

- E. Anytime the unit sounds an alarm, the operator should immediately check the Status Display and act accordingly, e.g., add water, remove from service, check the probe.
- F. The BLANKETROL II unit is equipped with a circuit breaker in the ON/OFF power switch to protect against current overload.

2-5. PATIENT PREPARATION AND BEDSIDE CARE

Effective use of the BLANKETROL II system must include proper patient care prior to and while using the hyper-hypothermia blanket(s).

CAUTION

THE DESIRED SETPOINT TEMPERATURE SHOULD BE SET ONLY AS PRESCRIBED BY AND UNDER THE ORDER OF A PHYSICIAN.

- A. A base line recording should be made of vital signs, level of consciousness and responsiveness.
- B. A dry sheet or DISPOSABLE-COVER should be placed between the hyper-hypothermia blanket and the patient when using PLASTI-PAD, MAXI-THERM, or TEMP-PAD Blankets. The MAXI-THERM LITE Blanket does not require an interposed sheet.

Standard nursing procedures while using a hyper-hypothermia blanket include the following tasks:

- A. Patient's vital signs should be recorded and evaluated frequently. Operating room, temperature sensitive and pediatric patients may deviate from normal responses to external applications of heat and cold. Patient core temperature and the condition of the skin in contact with the blanket and blanket water temperature should be checked every twenty minutes. Operating room, temperature sensitive and pediatric patients should be checked more frequently. Notify the physician if the patient's core temperature does not reach the prescribed temperature in the time prescribed or deviates from the prescribed temperature range.
- B. The position and the placement of the probe should be inspected regularly. Also, the BLANKETROL II unit activates an alarm when the patient probe registers outside the range of 30°C - 43.5°C (86°F - 110°F).
- C. Level of consciousness, strength of extremities, changes in cardiac rate, changes in cardiac rhythms, pupil size, and response should be observed and recorded.

- D. Changes in skin color, edema, inflammation, or indications of pressure, especially over bony prominences, should be noted and treated as ordered. Avoid prolonged tissue pressure and shearing forces over bony prominences.
- E. The patient should be turned and properly positioned frequently.

**WARNING**

THE PATIENT SHOULD BE CONSTANTLY ATTENDED. THE MISUSE OF HYPER-HYPOTHERMIA EQUIPMENT PRESENTS THE POTENTIAL FOR PATIENT INJURY.

CAUTION

THE APPLICATION OF HEATING OR COOLING MAY EFFECT THE TOXICITY OF PREP SOLUTIONS. PREP SOLUTIONS HAVE BEEN REPORTED TO INJURE THE SKIN WHEN ALLOWED TO REMAIN BETWEEN PATIENTS AND A WATER-CIRCULATING HEATING BLANKET DURING PROLONGED PROCEDURES. KEEP THE AREA BETWEEN THE PATIENT AND THE BLANKET DRY.

SECTION 3. OPERATING THE BLANKETROL II UNIT

3-1. INTRODUCTION

This section describes how to operate the BLANKETROL II unit in order to control your patient's temperature. First, collect the equipment and prepare the patient. Second, decide which mode of operation to use. Third, set the appropriate controls; Automatic Control Mode, Manual Control Mode, or Monitor Only Mode.

3-2. ARRANGING THE SYSTEM COMPONENTS

- A. Collect all supplies and equipment
 - 1. BLANKETROL II unit
 - 2. Hyper-hypothermia blanket(s)
 - 3. Dry sheet, bath blanket or DISPOSA-COVER
 - 4. Connecting hose, if using MAXI-THERM, MAXI-THERM LITE, or TEMP-PAD Disposable Blanket(s)
 - 5. 400 Series probe
 - 6. Connector cable (if using disposable probes)
 - 7. Distilled water
- B. Place the BLANKETROL II unit in the patient area, accessible to the correct power source.
- C. Review Section (I-4.) that outlines the features of the unit and control panel.
- D. Check the level of distilled water in the reservoir. To do so, lift the cover of the water fill opening and the water should be visible, touching the strainer. If needed, carefully add distilled water. In addition, if the water falls below a preset level, the alarm sounds and the Status display flashes LO WATER. The operator cannot proceed until this is corrected as described in Section (3-8.).
- E. Check that the power switch is in the OFF position.

- F. Inspect the power plug (3-prong for 100/115 VAC units, appropriate plug for 230/240 VAC units) for bent or missing prongs.
- G. Insert the 3-prong plug for 100/115 VAC (appropriate ground plug for 230/240 VAC units) into a properly grounded hospital grade receptacle.

**WARNING****DO NOT BY-PASS THE GROUND PLUG; ELECTRICAL HAZARDS MAY RESULT.**

- H. Lay the hyper-hypothermia blanket flat with the hose routed, without kinks, towards the unit.
- I. If the blanket is already filled, check that there are no leaks.
- J. Cover the blanket with a dry sheet, bath blanket or DISPOSABLE-COVER (if using PASTI-PAD, MAXI-THERM, or TEMP-PAD Blanket).
- K. Connect the blanket to the BLANKETROL II unit as described in Section (2-3.1.), Step (H).
- L. If a MAXI-THERM or MAXI-THERM LITE single-patient use hyper-hypothermia blanket is used, connect the color coded couplings of the connecting hose to the blanket as described in the instructions packaged with each blanket.
- M. Check that the blanket is flat and the connecting hose is not twisted or pinched.
- N. The hyper-hypothermia blanket may be precooled or prewarmed before positioning the patient. To do so, operate the unit in Manual Control Mode for a few minutes.
- O. Place the patient on the hyper-hypothermia blanket.
- P. If the patient's temperature is to be monitored as required in Automatic Control Mode or Monitor Only Mode, insert or attach a 400 Series probe in or to the patient.
 - 1. A rectal probe is inserted into the rectum and secured with tape to the leg of the patient.
 - 2. The diaphragm of a skin probe is taped to the patient, usually under the patient's arm or on the chest.

3. The esophageal probe is inserted in the patient. It is often preferred that the patient is comatose or under anesthesia when the probe is placed in the esophagus.

The probe should be inspected periodically to insure that it is not dislodged or impacted. The BLANKETROL II unit sounds an alarm when the reading from the probe falls below 30°C (86°F).

It is important that the probe be inserted in or attached to the patient at least one minute before pressing a Control Mode switch. This will prevent the accidental triggering of the CK PROBE Status message.

- Q. If a top hyper-hypothermia blanket is to be used, follow instructions in step (J).
- R. Connect the top blanket to the BLANKETROL II unit following the procedure described in Section (2-3.1.) Step (H).
- S. If no top hyper-hypothermia blanket is used, cover the patient with a top sheet and/or blanket. Patient preparation and bedside care are further described in Section (2-5.).
- T. Choose which operating mode to use: Operating in Automatic Control Mode is described in Section (3-3.). Operating in Manual Control Mode is described in Section (3-4.). Operating in Monitor Only Mode is described in Section (3-6.).

3-3. OPERATING THE BLANKETROL II UNIT IN AUTOMATIC CONTROL MODE

The BLANKETROL II unit can be set so that it operates based upon the actual temperature of the patient relative to the SETPOINT temperature. To do so, set the desired patient temperature in Celsius or Fahrenheit, insert or attach the probe in or to the patient and depress the AUTO CONTROL switch. The BLANKETROL II unit activates to heat or cool the water, to circulate the water, and to control and monitor the change in the patient's temperature.

After arranging the equipment as described in Section (3-2.), proceed as follows:

- A. Check the placement of the 400 Series probe in or on the patient.
- B. Insert the probe into the probe jack on the left side of the unit.

- C. Press the power switch to the "ON" position.
 1. The switch lights up green.
 2. The microprocessor board goes through self test.
 3. The Status display flashes CK SET PT.
 4. The Celsius or Fahrenheit indicator lights up.
- D. Consult the physician's orders to determine the desired patient temperature. As a safety precaution, the SETPOINT display can only be set between 30°C - 40°C (86°F - 104°F) to operate in Automatic Control Mode.
- E. Set the Celsius/Fahrenheit Selector switch (on the front panel) so that the required indicator (Celsius or Fahrenheit) is showing on the control panel.
- F. Press the TEMP SET switch.
 1. The microprocessor board beeps.
 2. The LED in the corner of the switch lights up.
 3. The SETPOINT display shows a temperature reading.
 4. The Status display shows SET TEMP.
- G. Press the Up arrow or Down arrow to change the SETPOINT display to the desired patient temperature. The display can only be set between 30°C - 40°C (86°F - 104°F).
 1. The microprocessor board beeps.
 2. The SETPOINT display changes.
- H. Press the AUTO CONTROL switch.
 1. The microprocessor board beeps.
 2. The LED in the corner of the switch lights up.
 3. The amber arrow to the right of the SETPOINT display lights up.
 4. The Patient display shows the patient's actual temperature.
 5. The Blanket/Water display shows the actual temperature of the circulating water.

6. The Status display shows COOLING, AT SET PT, or HEATING depending upon the relationship of the patient's temperature to the SETPOINT display.
7. A LED corresponding to the Status display lights up: amber (left) for COOLING, green (center) for AT SET PT, or amber (right) for HEATING.
8. The pump is activated. The heater or compressor may also be activated.
9. The Water Flow indicator on the right side panel begins to move.
10. The water moves from the unit to the blanket and returns to the unit.
- I. Check the Water Flow indicator to confirm that the water is circulating.
- J. Touch the hyper-hypothermia blanket to confirm that the blanket is heating/cooling.
- K. To make any changes in the control settings, press the TEMP SET switch and begin again.

The BLANKETROL II Unit is now operating in Automatic Control Mode. You should continue to monitor the unit and the patient. (Review the suggestions for patient care described in Section (2-5.).

If at any time the Status display shows a message other than the messages described in Automatic Control Mode procedures, make the changes indicated by the display and/or consult the list of display messages in Section (3-8.). If at any time the unit sounds an alarm and the Status display flashes a message, make the changes indicated.

To turn off the unit or discontinue hyper-hypothermia treatment, proceed as described in Section (3-7.).

NOTE: IN ORDER TO CHANGE FROM AUTOMATIC CONTROL MODE TO MANUAL CONTROL MODE, FIRST PRESS THE TEMP SET SWITCH AND THEN PROCEED TO MANUAL CONTROL MODE.

In order to change from Automatic Control Mode to Monitor Only Mode, simply press the Monitor Only switch.

**WARNING**

IF AT ALL POSSIBLE, REMOVE THE PROBE FROM PATIENT CONTACT BEFORE ACTIVATING AN ELECTROSURGICAL UNIT. THE RF INTERFERENCE MAY CAUSE THE PATIENT TEMPERATURE DISPLAY TO MOVE UP AND DOWN AND CYCLE THE MACHINE FROM COOLING TO HEATING OR VICE VERSA.

3-4. OPERATING THE BLANKETROL II UNIT IN MANUAL CONTROL MODE

The BLANKETROL II unit can be set so that it operates based upon the actual temperature of the circulating water relative to the SETPOINT temperature. To do so, set the desired water temperature, in Celsius or Fahrenheit (100/115V only), and depress the MANUAL CONTROL Switch. The BLANKETROL II unit activates to heat or cool the water and to circulate the water. The operator must continue to monitor the patient's temperature.

Given the many variables such as patient size, weight, or condition, there is no direct relationship between the temperature of the circulating water and the patient's temperature. Both water temperature and the patient temperature must be closely watched.

After arranging the equipment as described in Section (3-2.), proceed as follows:

- A. Press the power switch to the "ON" position.
 - 1. The switch lights up green.
 - 2. The microprocessor board goes through self-test.
 - 3. The Status display flashes CK SET PT.
 - 4. The Celsius or Fahrenheit indicator lights up.
- B. Consult the physician's orders to determine the desired patient temperature and the desired water temperature setting.
- C. Set the Celsius/Fahrenheit Selector switch (on the front panel) so the required indicator (Celsius or Fahrenheit) is showing on the control panel.

6. The Status display shows COOLING, AT SET PT, or HEATING depending upon the relationship of the patient's temperature to the SETPOINT display.
7. A LED corresponding to the Status display lights up: amber (left) for COOLING, green (center) for AT SET PT, or amber (right) for HEATING.
8. The pump is activated. The heater or compressor may also be activated.
9. The Water Flow indicator on the right side panel begins to move.
10. The water moves from the unit to the blanket and returns to the unit.
- I. Check the Water Flow indicator to confirm that the water is circulating.
- J. Touch the hyper-hypothermia blanket to confirm that the blanket is heating/cooling.
- K. To make any changes in the control settings, press the TEMP SET switch and begin again.

The BLANKETROL II Unit is now operating in Automatic Control Mode. You should continue to monitor the unit and the patient. (Review the suggestions for patient care described in Section (2-5.).

If at any time the Status display shows a message other than the messages described in Automatic Control Mode procedures, make the changes indicated by the display and/or consult the list of display messages in Section (3-8.). If at any time the unit sounds an alarm and the Status display flashes a message, make the changes indicated.

To turn off the unit or discontinue hyper-hypothermia treatment, proceed as described in Section (3-7.).

NOTE: IN ORDER TO CHANGE FROM AUTOMATIC CONTROL MODE TO MANUAL CONTROL MODE, FIRST PRESS THE TEMP SET SWITCH AND THEN PROCEED TO MANUAL CONTROL MODE.

In order to change from Automatic Control Mode to Monitor Only Mode, simply press the Monitor Only switch.

- G. Check the Water Flow indicator to confirm that the water is circulating.
- H. Touch the hyper-hypothermia blanket to confirm that the blanket is heating/cooling.
- I. To make any changes in the control setting, press the TEMP SET switch and begin again.

The BLANKETROL II unit is now operating in Manual Control Mode. The operator must continue to monitor the change in the patient's temperature. (Review the suggestions for patient care described in Section (2-5.).

When operating in Manual Control Mode, the unit should be turned off when the patient's temperature is $.5^{\circ} \pm 1^{\circ}\text{C}$ ($1^{\circ} \pm 2^{\circ}\text{F}$) above the desired patient temperature to avoid complications associated with temperature drift.

If at any time the Status display shows a message other than the messages described in Manual Control procedures, make the changes indicated by the display and/or consult the list of display messages in Section (3-8.). If at any time the unit sounds an alarm and the Status display flashes a message, make the changes as indicated.

To turn off the unit or discontinue hyper-hypothermia treatment, proceed as described in Section (3-7.).

NOTE: IN ORDER TO CHANGE FROM A MANUAL CONTROL MODE TO AUTOMATIC CONTROL MODE, FIRST PRESS THE TEMP SET SWITCH AND THEN PROCEED TO AUTOMATIC CONTROL MODE.

In order to change from Manual Control Mode to Monitor Only Mode, simply press the Monitor Only switch.

3-5. OPERATING THE BLANKETROL II UNIT IN MANUAL CONTROL MODE WITH THE ADDITION OF THE PATIENT PROBE

When the BLANKETROL II Unit is set to operate in Manual Control Mode, the patient probe can be inserted to monitor the patient's temperature. The unit continues to operate based upon the temperature of the circulating water relative to the desired Blanket/Water temperature.

After arranging the equipment as described in Section (3-2.), proceed as follows:

- A. Check the placement of the 400 Series probe into or onto the patient.
- B. Insert the probe into the probe jack on the right side of the unit.
- C. Follow Steps (A - I) as described in Section (3-4.). In addition to the Blanket/Water display showing actual water temperature, the Patient display shows the actual patient temperature.

- D. Press the TEMP SET Switch.
1. The microprocessor board beeps.
 2. The LED the corner of the switch lights up.
 3. The SETPOINT display shows a temperature reading.
 4. The Status display shows SET TEMP.
- E. Press the Up arrow or Down arrow to change the SETPOINT display to the desired Blanket/Water temperature. As a safety precaution, the Blanket/Water temperature can only be set between 4°C - 42°C (39.2°F - 107.6°F).
1. The microprocessor board beeps.
 2. The SETPOINT display changes.
- F. Press the MANUAL CONTROL switch.
1. The microprocessor board beeps.
 2. The LED in the corner of the switch lights up.
 3. The arrow to the left of the SETPOINT display lights up.
 4. The BLANKET/WATER display shows the actual temperature of the circulating water.
 5. The Status display shows COOLING, AT SET PT, or HEATING depending upon the relationship of the circulating water to the SETPOINT display.
 6. A LED corresponding to the Status display lights up: amber (left) for COOLING, green (center) for AT SET PT, or amber (right) for HEATING.
 7. The pump is activated. The heater or compressor may be activated.
 8. The Water Flow indicator on the right side panel begins to move.
 9. The water moves from the unit through the blanket and returns to the unit.

3-6. OPERATING THE BLANKETROL II UNIT IN MONITOR ONLY MODE

The BLANKETROL II unit can be set so it displays the patient's temperature but does not heat, cool, or circulate the water. In this operating mode the patient may or may not already be positioned on a hyper-hypothermia blanket, but the unit and the probe must be arranged as described in Section (3-2.).

After arranging the equipment, proceed as follows:

- A. Check the placement of the 400 Series probe into or onto the patient.
- B. Insert the probe into the probe jack on the right side of the unit.
- C. Press the power switch to the "ON" position.
 - 1. The switch lights up green.
 - 2. The microprocessor board goes through self-test.
 - 3. The Status display flashes CK SET PT.
 - 4. The Celsius or Fahrenheit indicator lights
- D. Consult the physician's orders to determine the desired patient temperature.
- E. Set the Celsius/Fahrenheit selector switch (on the front panel) so that the required indicator (Celsius or Fahrenheit) is showing on the control panel (100/115V only).

The BLANKETROL II Unit is now operating in Manual Control Mode while monitoring the patient's temperature. However, you must also monitor the patient's temperature. (Review the suggestions for patient care described in Section (2-5.).

When operating in Manual Control Mode, the unit should be turned off when the patient's temperature is $.5^{\circ} \pm 1^{\circ}\text{C}$ ($1^{\circ} \pm 2^{\circ}\text{F}$) above the desired patient temperature to avoid complications associated with temperature drift.

If at any time the Status display shows a message other than the messages described in Manual Control procedures, make the changes indicated by the display and/or consult the list of display messages in Section (3-8.). If at any time the unit sounds an alarm and the Status display flashes a message, make the changes as indicated.

To turn off the unit or discontinue hyper-hypothermia treatment, proceed as described in Section (3-7.).

NOTE: IN ORDER TO CHANGE FROM AUTOMATIC CONTROL MODE TO MANUAL CONTROL MODE, FIRST PRESS THE TEMP SET SWITCH AND THEN PROCEED TO MANUAL CONTROL MODE.

In order to change from Manual Control Mode to Monitor Only Mode, simply press the Monitor Only switch.

**WARNING**

IF AT ALL POSSIBLE, REMOVE THE PROBE FROM PATIENT CONTACT BEFORE ACTIVATING AN ELECTROSURGICAL UNIT. THE RF INTERFERENCE MAY CAUSE THE PATIENT TEMPERATURE DISPLAY TO MOVE UP AND DOWN AND CYCLE THE MACHINE FROM COOLING TO HEATING OR VICE VERSA.

3-7. CONCLUDING HYPER-HYPOTHERMIA TREATMENT

After the patient temperature reaches the prescribed temperature for the prescribed amount of time, discontinue the use of the BLANKETROL II unit as ordered. Patient's temperature can drift up or down $.5^{\circ}\text{C} \pm 1^{\circ}\text{C}$ ($1^{\circ}\text{F} \pm 2^{\circ}\text{F}$) after therapy has been discontinued. The drift may be greater if the patient has been shivering and treatment is abruptly discontinued. The operator should continue to monitor the patient's temperature. To do so, the operator may choose to operate the unit in Monitor Only Mode as described in Section (3-6.).

To change the mode of operation or to stop the unit, the operator must press the TEMP SET switch or turn the power switch to the "OFF" position.

When the hyper-hypothermia therapy is concluded and the unit is turned OFF:

- A. Permit the blanket(s) and hose to remain connected to the unit for about ten minutes. This allows some of the water to drain back into the unit.
- B. Remove the probe from the patient and probe jack. Maintenance of the REUSABLE probe is described in Section (4-7.).
- C. Disconnect the power cord from the power source, loosely coil it and attach it to the back panel using the nylon strap.
- D. Disconnect the connecting nose from the unit.
- E. Remove the blanket(s).
- F. For reusable PLASTIPAD blankets, loosely coil the hose lengthwise in the center of the blanket. Fold the blanket lengthwise into the center, 1/3 from the left side and 1/3 from the right side. Maintenance of the blanket is described in Section (4-6.).

For Single-Patient Use MAXI-THERM, MAXI-THERM LITE, or TEMP-PAD Blankets, follow the instructions packaged with the blanket.

- F. Press the TEMP SET switch.
1. The microprocessor board beeps.
 2. The LED in the corner of the switch lights up.
 3. The SETPOINT display shows a temperature reading.
 4. The Status display shows SET TEMP.
- G. Press the MONITOR ONLY switch.
1. The microprocessor board beeps.
 2. The LED in the corner of the switch lights up.
 3. The Status display shows MONITOR.
 4. The Patient display shows the patient's temperature.
 5. The SETPOINT display goes blank.
- H. To make any changes in the control settings, press the TEMP SET switch and begin again.

The BLANKETROL II unit is now operating in Monitor Only Mode.

If at any time the Status display shows a message other than the messages described in Monitor Only Mode procedures, make the changes indicated by the display and/or consult the list of display messages in Section (3-8.). If at any time the unit sounds an alarm and the Status display flashes a message, make the changes indicated. To turn off the unit or discontinue hyper-hypothermia treatment, proceed as described in Section (3-7.).

NOTE: IN ORDER TO CHANGE FROM MONITOR ONLY MODE TO ANOTHER OPERATING MODE, FIRST PRESS THE TEMP SET SWITCH AND THEN SET THE OPERATING MODE OF CHOICE.

	WARNING	
IF AT ALL POSSIBLE, REMOVE THE PROBE FROM PATIENT CONTACT BEFORE ACTIVATING AN ELECTROSURGICAL UNIT. THE RF INTERFERENCE MAY CAUSE THE PATIENT TEMPERATURE DISPLAY TO MOVE UP AND DOWN AND CYCLE THE MACHINE FROM COOLING TO HEATING OR VICE VERSA.		

This can occur if the probe is not inserted in the probe jack prior to pressing the AUTO CONTROL switch, if the probe is dislodged from the patient, if the patient's temperature falls below 30°C (86°F), if the probe is defective, or if other than a 400 Series probe was inserted into the probe jack. After pressing the SILENCE ALARM switch and checking the probe, the operator must press the TEMP SET switch to proceed.

- F. HI TEMP: This message occurs when the water temperature reaches 44.6°C ± 2°C (112°F ± 4°F). The message flashes, the microprocessor board's beeper sounds and the heater shuts off. Pressing the silence alarm switch will silence the alarm for five minutes.
- G. HI LIMIT: This message occurs when the back-up safety device is triggered because the circulating water and reservoir have reached the high temperature of 46°C ± 2°C (115°F ± 4°F). The message flashes, the alarm sounds, the unit shuts down and the REMOVE FROM SERVICE indicator lights up. The operator MUST disconnect the power cord from the power source; the alarm continues to sound until this is done. The unit cannot be used again until it is serviced.
- H. LO TEMP: This message occurs when the water temperature reaches 3°C ± 1°C (38°F ± 2°F) or is below the minimum low control setting. The messages flash and the microprocessor board's beeper sounds. The refrigeration solenoid closes. The operator MUST press the silence alarm switch or turn the unit off. The alarm continues to sound until this is done. The SILENCE ALARM switch will silence the alarm for one (1) minute. If the water temperature has risen more than 1°C (2°F) when the SILENCE ALARM switch is pressed, the unit will start operating normally.
- I. LO LIMIT: This message occurs when the back-up safety device is triggered because the water temperature sensor has reached the low temperature limit of 1°C ± 1°C (34°F ± 2°F). The message flashes, the alarm sounds, the unit shuts down, and the REMOVE FROM SERVICE indicator lights up. The operator MUST unplug the unit; the alarm continues to sound until this is done. The unit cannot be used again until it is serviced.
- J. LO WATER: This message occurs when the water in the reservoir is below a preset level. This message flashes, the alarm sounds and the unit shuts down until the water level is increased.

To do so, press the SILENCE ALARM switch and pour distilled water in the water fill opening until the water reaches the strainer visible at the bottom. The display changes to show Set Temp. In order to proceed, the operator must select an Operating Mode.

- K. MONITOR: This message occurs when the unit is operating in the Monitor Only Mode. The unit does not heat, cool, or circulate water.

3-8. STATUS DISPLAY MESSAGES

The Status display located in the center of the BLANKETROL II unit control panel reports the operating status of the unit or indicates changes the operator must make. The Status display can show different messages to guide the operator. The following list defines each message and describes the changes, if any, the operator must make:

- A. **ATSETPT:** This message occurs when the temperature of the circulating water (if in Manual Control Mode) or of the patient (if in Automatic Control Mode) is "AT SETPOINT" temperature.
- B. **COOLING:** This message occurs when the temperature of the circulating water (if in Manual Control Mode) or of the patient (if in Automatic Control Mode) is above the SETPOINT temperature and the cooling system is activated.
- C. **HEATING:** This message occurs when the temperature of the circulating water (if in Manual Control Mode) or of the patient (if in the Automatic Control Mode) is below the SETPOINT temperature and the heating system is activated.
- D. **CK SETPT:** This message occurs when operator should check the SETPOINT temperature for two possible reasons:
 - 1. When the operator turns the unit ON after just having plugged in the unit, the flashing display indicates that the operator should check the SETPOINT temperature before proceeding. This is done by pressing the TEMP SET switch.
 - 2. When the operator presses the AUTO CONTROL switch, the CK SETPT message flashes if the SETPOINT display shows a temperature that is outside the temperature range of the Automatic Control Mode 30°C - 40°C (86°F - 104°F). The unit will not permit the operator to proceed to Automatic Control Mode operations until the SETPOINT is checked. To do so, the operator must press the TEMP SET switch and check/change the SETPOINT display. If the CK SETPT display flashes for five minutes, the alarm will sound until the operator proceeds to the next step. This alarm will also help to notify the operator if there has been an interruption in power.
- E. **CK PROBE:** This message occurs when the operator must check the probe. This message flashes, the alarm sounds and the unit shuts down when the probe is sensing a temperature below 30°C (86°F).

This can occur if the probe is not inserted in the probe jack prior to pressing the AUTO CONTROL switch, if the probe is dislodged from the patient, if the patient's temperature falls below 30°C (86°F), if the probe is defective, or if other than a 400 Series probe was inserted into the probe jack. After pressing the SILENCE ALARM switch and checking the probe, the operator must press the TEMP SET switch to proceed.

- F. HI TEMP: This message occurs when the water temperature reaches 44.6°C ± 2°C (112°F ± 4°F). The message flashes, the microprocessor board's beeper sounds and the heater shuts off. Pressing the silence alarm switch will silence the alarm for five minutes.
- G. HI LIMIT: This message occurs when the back-up safety device is triggered because the circulating water and reservoir have reached the high temperature of 46°C ± 2°C (115°F ± 4°F). The message flashes, the alarm sounds, the unit shuts down and the REMOVE FROM SERVICE indicator lights up. The operator MUST disconnect the power cord from the power source; the alarm continues to sound until this is done. The unit cannot be used again until it is serviced.
- H. LO TEMP: This message occurs when the water temperature reaches 3°C ± 1°C (38°F ± 2°F) or is below the minimum low control setting. The messages flash and the microprocessor board's beeper sounds. The refrigeration solenoid closes. The operator MUST press the silence alarm switch or turn the unit off. The alarm continues to sound until this is done. The SILENCE ALARM switch will silence the alarm for one (1) minute. If the water temperature has risen more than 1°C (2°F) when the SILENCE ALARM switch is pressed, the unit will start operating normally.
- I. LO LIMIT: This message occurs when the back-up safety device is triggered because the water temperature sensor has reached the low temperature limit of 1°C ± 1°C (34°F ± 2°F). The message flashes, the alarm sounds, the unit shuts down, and the REMOVE FROM SERVICE indicator lights up. The operator MUST unplug the unit; the alarm continues to sound until this is done. The unit cannot be used again until it is serviced.
- J. LO WATER: This message occurs when the water in the reservoir is below a preset level. This message flashes, the alarm sounds and the unit shuts down until the water level is increased.

To do so, press the SILENCE ALARM switch and pour distilled water in the water fill opening until the water reaches the strainer visible at the bottom. The display changes to show Set Temp. In order to proceed, the operator must select an Operating Mode.

- K. MONITOR: This message occurs when the unit is operating in the Monitor Only Mode. The unit does not heat, cool, or circulate water.

- L. SENSOR: This message occurs when the water temperature sensor malfunctions. The message flashes, the alarm sounds, the unit shuts down, and the REMOVE FROM SERVICE indicator lights up. The operator MUST unplug the unit, the alarm continues to sound until this is done. The unit cannot be used again until it is serviced as described in Section (5-7.).
- M. SET TEMP: This message occurs when the TEMP SET switch is pressed. The SETPOINT display can now be changed by pressing the Up or Down arrow.
- N. BD PROBE: This message occurs if there is a direct short in the probe circuit. The message flashes, the alarm sounds and the unit shuts down only if the unit is operating in the automatic control mode. When the unit is running in the manual control mode or monitor only mode, the patient display will go blank if there is a direct short.
- O. AD BAD: This message occurs if there is a problem in the analog to digital converter or affiliated circuitry. The unit's transformer (if defective) may also cause this message to appear.
- P. NRAM BAD: This message occurs if there is a problem with the NOV RAM or affiliated circuitry.
- Q. CPU BAD: This message occurs if there is a problem with the Central Processing Unit or affiliated circuitry.

OPTIONAL:

The following messages will appear only on units with serial number 882-6870 and above equipped with a low flow alarm kit.

- R. FLOW OK: This message occurs after positive flow is sensed returning to the unit. This message will display for thirty seconds after a positive flow is sensed.

NOTE: IT IS NECESSARY TO HAVE A POSITIVE FLOW AND SEE THE "FLOW OK" MESSAGE BEFORE THE LOW FLOW ALARM WILL BE ACTIVATED.

- S. LOW FLOW: This message occurs when the water flow is less than 6 GPH. The message flashes and the alarm sounds until the flow is increased above 6 GPH.

SECTION 4. GENERAL MAINTENANCE OF THE BLANKETROL II SYSTEM

4-1. INTRODUCTION

This section describes the general requirements maintenance personnel should complete on a regular basis so that the BLANKETROL II System continues to operate within the manufacturers' allowable tolerances.

These requirements include changing and replenishing the water in the reservoir; cleaning the water filter, the exterior of the unit, the front grille, the condenser, the thermistor probes, and the hyper-hypothermia blankets. The repair of reusable hyper-hypothermia blankets is also described. Figure (4-1) outlines the recommended maintenance schedule for these requirement and Figure (4-2) provides a convenient checklist to record the maintenance history of the unit.

The description of each requirement includes the tools, the procedures, and the precautions necessary to complete the requirement. Maintenance, repair and/or service of BLANKETROL II by qualified maintenance/technical personnel will not void the warranty of the unit.

ACTION	MONTHLY	QUARTERLY	SIX MONTHS	AS NEEDED
Draining/Replenishing the Reservoir	X			
Cleaning the Condenser and Grille	X			
Maintenance Checklist - See Figure 4-2.		X		
Cleaning the Water Filter			X	
Cleaning Water System				X
Cleaning Hyper-Hypothermia Blankets				X
Cleaning the Exterior of the Unit				X
Cleaning Thermistor Probes				X
Check Leakage Current				X
Check Sight Glass				X
Cleaning the Water Flow Indicator Assembly				X

FIGURE 4-1. MAINTENANCE SCHEDULE

4-1.1 TEST EQUIPMENT REQUIRED

The following test equipment is required to perform the preventive maintenance/functional check-out procedures:

- CSZ's model TFR (Temperature Tester, Flow Meter, Resistance Tester)
 - Need Probe Extension Cable #TM-4A
 - Need Hose Assembly #TM-6
- 400 Series Probes or calibrated Mercury Thermometer
- 7 inch, 10 gauge jumper wire (stripped at one end and with an alligator clip on the other end)
- 4 inch, 16 gauge jumper wire (stripped at both ends)
- Leakage Current Tester
- Small slotted screwdriver and a phillips screwdriver

SUGGESTED PREVENTIVE MAINTENANCE CHECKLIST
(At Least Quarterly)

BLANKETROL II - Model 222R

Serial Number _____

Hospital I.D. No. _____
CompletedCheck When

- | | | |
|-----|---|--------------------------|
| 1. | External cabinet in good condition. (No unusual dents or missing parts) | ☐ |
| 2. | All labels properly affixed. | ☐ |
| 3. | Quick disconnect coupling are tight, straight, and not leaking. | ☐ |
| 4. | Power cord (no cuts or exposed wire) and plug (no bent or missing prongs). | ☐ |
| 5. | Indicator lights are operative. | ☐ |
| 6. | Drain and clean reservoir. See section 4-2. | ☐ |
| | a. Check circulation through each male coupling with drain hose | ☐ |
| 7. | Clean water filter. See section 4-3. | ☐ |
| 8. | Refill reservoir with distilled/sterile water. See section 4-2.2. | ☐ |
| 9. | Condition of blankets, hoses, and couplings (check for leaks). | ☐ |
| 10. | Connecting hoses are tight and not leaking. | ☐ |
| 11. | Leakage current check; all readings should be under 300 microamps. (100/115V) | ☐ |
| | Leakage current check; all readings should be under 500 microamps. (230/240V) | ☐ |

See Section 5-18.

OFF Normal Polarity _____

OFF Reverse Polarity _____

ON Normal Polarity (heat) _____

ON Reverse Polarity (heat) _____

ON Normal Polarity (cool) _____

ON Reverse Polarity (cool) _____

- | | | |
|-----|--|--------------------------|
| 12. | Check flow rate and pressure.
greater than .60 GPM _____ less than 10 PSI _____ | |
| 13. | Check the high temp safety 44.6°C +/- 2°C (112°F +/- 4°F) Reference section 5-21 | ☐ |
| 14. | Check the high limit safety 46.0°C +/- 2°C (115°F +/- 4°F) Reference section 5-21 | ☐ |
| 15. | Check the low temp safety 3°C +/- 1°C (38°F +/- 2°F) Reference section 5-20 | ☐ |
| 16. | Check the low limit safety 1°C +/- 1°C (34°F +/- 2°F) Reference section 5-20 | ☐ |
| 17. | Alarm silence is 5 minutes except low temp which is one minute. | ☐ |

Signature of Inspector_____
Date of Inspection

FIGURE 4-2. MAINTENANCE CHECKLIST

4-2. MAINTENANCE OF THE WATER RESERVOIR

The dual compartment reservoir holds approximately 2 gallons (7.5 liters) of distilled water that remains in the unit between periods of use. Once a month the water reservoir should be drained and replenished. The drain hose, included in the packaging of the unit, is attached and the water is pumped out of the unit. When the LO WATER alarm sounds, the remaining water is drained by gravity. Distilled/sterile water (or distilled water-bacteriostatic agent preparation) is then poured into the reservoir.

NOTE: DO NOT USE DE-IONIZED WATER OR ALCOHOL.

**FLUID CIRCUIT DISINFECTION/DRY STORAGE PROCEDURE
for Circulating Water Units Utilizing Airkem® A-33®**

The following procedure disinfects the fluid circuit in these products. If the product is to be placed back into service, stop after step #8. For protracted storage in a dry state, complete the procedure. The required tools/supplies are appropriate drain hose(s) and/or hose connector(s), a source of compressed air/nitrogen, Airkem® A-33® Disinfectant Packets, distilled water, and the appropriate AC electrical power.

1. Prepare distilled water/ A-33 solution in the volume needed to fill the unit's reservoir(s). Solution must be in the ratio of one packet of A-33 per gallon of distilled water. Set aside for later use.
2. Turn unit **OFF**.
3. Drain the water from the reservoir as described in the Technical Manual for the unit.
4. Flush unit:
 - a). Fill the reservoir with solution prepared in step #1.
 - b). Turn unit **ON**, set to heat to 100°F (38°C), and circulate for 5 minutes; for cooling units, set to cool to 50°F (10°C) and circulate for 5 minutes.
 - c). Drain unit as instructed in the Technical Manual for the unit.
 - d). Repeat steps 4.a - c. 3 times.
5. If unit is to be returned to service, replenish reservoir(s) with the appropriate volume of distilled water.
6. If unit is being placed in dry storage, continue with procedure.
7. When all fluid has been removed from the unit, disconnect the drain hose(s) and wipe unit clean.
8. Unit is now ready for storage.

When you are ready to return unit to service, replenish the reservoir(s) with distilled water. Perform all the checks as described in the respective **Operation and Technical Manual**.

Airkem and A-33 are registered trademarks of Ecolab Inc.

(OPTIONAL METHOD)
FLUID CIRCUIT DISINFECTION/DRY STORAGE PROCEDURE
for Circulating Water Units Utilizing Household Bleach (Sodium Hypochlorite)

The following procedure disinfects the fluid circuit in these products. If the product is to be placed back into service, stop after step #9. For protracted storage in a dry state, complete the procedure. The required tools/supplies are appropriate drain hose(s) and/or connector(s), a source of compressed air/nitrogen, a supply of household bleach (sodium hypochlorite), Fac-Chek pH strips, distilled water, and the appropriate AC electrical power.

1. Turn unit OFF.
2. Drain the water from the reservoir as described in the Technical Manual for the unit.
3. Flush unit:
 - a). Prepare a 9:1 solution of water and sodium hypochlorite (9 parts water and 1 part sodium hypochlorite). Fill reservoir with solution.
 - b). Turn unit **ON**, set to heat to 100°F (38°C), and circulate for 5 minutes; for cooling units, set to cool to 50°F (10°C) and circulate for 5 minutes.
 - c). Drain unit as instructed in the Technical Manual for the unit.
 - d). Repeat steps 3.a - c. 3 times.
4. Rinse unit three (3) times as described in Steps 3 a-c above, using **distilled water only**.
5. Fill reservoir(s) with distilled water and circulate.
6. Check the water with Fac-Chek pH strips or other appropriate method for detecting bleach. If bleach is detected, repeat steps 5 and 6.
7. When you no longer detect any bleach, drain reservoir.
8. **If unit is to be returned to service**, replenish reservoir(s) with the appropriate volume of distilled water.

If unit is being placed in dry storage, continue with procedure.
9. Re-connect the drain hose and drain all the fluid from the unit as in step #3 above, leaving drain hose attached.
10. When all fluid has been removed from the unit, disconnect the drain hose(s) and wipe unit clean.
11. Unit is now ready for storage.

When you are ready to return unit to service, replenish the reservoir(s) with distilled water. Perform all the checks as described in the respective **Operation and Technical Manual**.

4-2.1. DRAINING THE RESERVOIR

- A. Collect these items:
 - 1. An empty container to drain the water into that can hold at least 3 gallons (11.4 liters).
 - 2. The drain hose with a female quick-disconnect coupling usually found in the storage drawer of the unit.
 - 3. 2 gallons (7.6 liters) distilled/sterile water to replenish the reservoir.
- B. Insert the drain end of the hose into the 3 gallon (11.4 liters) container. Set the container on the floor so the hose drains downward.
- C. Attach the female coupling of the drain hose to any one of the male outlet couplings on the right side of the unit.
 - 1. Slide back the collar of the female coupling.
 - 2. Insert the female coupling over the male coupling.
 - 3. Release the collar so the coupling 'Snaps' into position.
- D. Plug the power cord into a properly grounded power outlet.
- E. Place the power switch to the "ON" position.
- F. Press the TEMP SET switch.
- G. Press the MANUAL CONTROL switch.

The water is pumped into the container until there is approximately ½ gallon (1.9 liters) of water remaining to be drained. The Status display flashes LO WATER and the alarm sounds. The unit shuts down but the water continues to drain into the container because of gravitational pull.

- H. Press the SILENCE ALARM switch.
- I. Press the power switch to the OFF position.
- J. Disconnect the power cord from the power source.
- K. After all the water has drained from the unit, disconnect the drain hose, wipe, clean and store without disinfecting.

- L. Discard the water drained from the unit.
- M. If any other maintenance/repair is to be completed, go to the appropriate section, e.g., cleaning the water filter. If not, go to Section (4-2.2.) to replenish the reservoir.

4-2.2. REPLENISHING THE RESERVOIR

- A. Check that the drain hose is disconnected.
- B. Lift the water fill opening lid and gradually pour approximately 2 gallons (7½ liters) of distilled water (or the distilled water-bacteriostatic preparation described in Section (4-2.) into the reservoir (DO NOT USE ALCOHOL OR DE-IONIZED WATER).
- C. Stop pouring when the water reaches the strainer visible at the bottom of the water fill opening.
- D. Proceed with normal operations; always check the water level before starting.

4-3. MAINTENANCE OF THE WATER FILTER

The BLANKETROL II circulating system includes a water filter designed to clear the line of any particulate matter as the water is pumped through the system. As shown in Figure (5-1), the water filter assembly is a plastic T-shaped fitting that intersects the hose from the water flow indicator to the reservoir. A stainless steel wire-mesh screen is located inside the clear plastic cap of the water filter assembly.

Once every six months, or more often if deemed necessary, the water filter should be disassembled and cleaned. To do so, the reservoir must first be drained and the rear enclosure panel removed. The cap of the water filter assembly is unscrewed. The wire mesh and the plastic cap are cleaned. The parts are then reassembled.

After draining the reservoir as described in Section (4-2.1.):

- A. Disconnect the unit from its power source.
- B. Using a Phillips head screwdriver, remove the four screws of the rear enclosure panel. Guide the panel towards the floor so the tab along the top edge of the panel clears the bottom edge of the top assembly.
- C. Locate the water filter assembly as shown in Figure (5-1).

- D. Firmly grasp the notched rim of the cap of the assembly and turn it counterclockwise. The cap may contain a small amount of water. The wire mesh may be lodged in the top of the fitting or it may be resting in the plastic cap.
- E. Remove the wire mesh.
- F. Clean the wire mesh and the plastic cap. Be careful not to lose the black O-ring in the rim of the plastic cap.
- G. Replace the wire mesh in the plastic cap and position the wire mesh, O-ring and plastic cap.
- H. Screw the cap clockwise onto the fitting until it is secure.
- I. Replace the rear enclosure panel; first insert the tab edge of the back panel under the bottom edge of the top assembly. Replace the four screws.
- J. Replenish the water reservoir as described in Section (4-2.2.).

4-4. MAINTENANCE OF THE CONDENSER AND GRILLE

The BLANKETROL II cooling system includes a front panel grille that permits air to be drawn into the unit and over the condenser. The air is then discharged through the bottom of the unit. Anytime the unit is operating, the front grille should not be blocked.

Once a month the grille and the fins of the condenser should be cleaned to remove any accumulated dust and lint. To clean the condenser and grille:

- A. Using a Phillips screwdriver, remove the four screws of the front panel grille. Pull the grille forward and remove.
- B. Using a brush or a vacuum, dust both sides of the front panel grille.
- C. Next, brush or vacuum the fins of the condenser. Be careful not to bend any of the fins.
- D. Replace the front panel grille and secure it with the four Phillips screws.

4-5. MAINTENANCE OF THE BLANKETROL II EXTERIOR

The BLANKETROL II unit is constructed of powder coated steel with a plastic top. Wipe outer surfaces with cloth treated in a solution of water and mild detergent. Rinse cloth of excess solution before applying to unit. Do not use alcohol or acid base cleaner on the control panel.

4-6. MAINTENANCE OF THE HYPER-HYPOTHERMIA BLANKETS

This section describes the general maintenance and repair procedures for the PLASTIPAD (reusable) and MAXI-THERM, MAXI-THERM LITE, and TEMP-PAD (disposable) blankets. General maintenance tasks include cleaning, draining, and storing the blankets. Repair procedures are included for the PLASTIPAD blankets.

4.6.1 PLASTIPAD REUSABLE BLANKET

Cincinnati Sub-Zero reusable plastic blankets (PLASTIPAD) are constructed from rugged polyurethane. This extra-strength material helps resist punctures and provides triple the seam strength of most other plastic blankets. Because of our random flow design, it allows even temperature distribution and faster water circulation which results in better cooling and heating rates. Because it is nonporous, stains and debris can be easily wiped away with soap and water. As necessary, cold sterilizable solution can be used for the O.R. The blankets may be gas sterilized, however, DO NOT exceed 140°F and aerate properly. DO NOT AUTOCLAVE!

The blanket should not be drained after each use. Water remaining after use will not damage the blanket. If it becomes necessary to drain the blanket, remove both the male and female fittings on the hose leading from the blanket. Insert a compressed air nozzle into one end of the connecting hose and force the water out the other end with compressed air (10 psi maximum). After the water is removed, apply silicone caulking/teflon tape around the threads of the hose barbs. Reattach the male and female fittings onto the hoses.

PLASTIPAD blankets can be patch repaired if the blanket is punctured and begins to leak. A PLASTIPAD Patch Kit with instructions is available at no charge upon request.

To store PLASTIPAD blankets, loosely coil the hose lengthwise into the center of the blanket. Fold the blanket lengthwise into the center, 1/3 from the left side and 1/3 from the right side. Do not fold the blankets width-wise, as doing so will crimp the tubing.

4-6.2. MAXI-THERM , MAXI-THERM LITE, and TEMP-PAD (DISPOSABLE) HYPER-HYPOTHERMIA BLANKETS

The reusable blanket maintenance procedures do not apply to these single-patient use blankets. These single-patient use blankets offer the highest flow rate with a random flow pattern of any disposable blanket system. This results in less temperature differential between the blanket surface and the reservoir fluid in the unit while providing maximum thermal transfer from blanket to patient. Easy-to-use color-coded quick connectors and shut-off clamps make set-up and disposal a "snap". Maximum patient comfort is assured by a soft, opaque vinyl or non-woven surface which produces a cushioning effect. The vinyl surface blankets can be wiped clean if soiled in use enabling them to last for the duration of the average patient stay.

4-7. MAINTENANCE OF REUSABLE THERMISTOR PROBES

The standard 400 Series probe consists of a thermistor temperature sensing element housed in a probe and attached to a plasticized vinyl-jacketed, shielded, lead wire terminated with a phone plug. Refer to the printed material enclosed with each probe regarding temperature specifications, cautions, and maintenance.

In general, clean with a damp cloth and mild detergent. When not in use, the probes should be loosely coiled and stored at room temperature. Never boil or autoclave the vinyl jacketed leadwire. Avoid contact with strong aromatic chlorinated, ketone, ether, or ester solvents.

When cleaning or sterilizing, the probe should be handled gently. Excessive pressure can stretch the covering and/or break the internal wires. At high temperatures, the vinyl softens and can be deformed by pressure and stress. **DO NOT AUTOCLAVE.**

Probes may be disinfected and sanitized by washing with 3% hydrogen peroxide or 70% isopropanol. Brief immersions in detergent solutions are not harmful. Prolonged immersions in detergent solutions will cause the vinyl to lose flexibility. Phenol disinfectants should be avoided. Ethylene oxide sterilization does not damage the probe, but gas is highly irritating and is absorbed by the plastic parts. Directions given by the manufacturer of the sterilizer must be closely followed, especially regarding temperature and aeration.

CAUTION

DO NOT IMMERSE THE PROBE-JACK PLUG CONNECTOR IN LIQUID.

4-8. MAINTENANCE OF THE WATER CIRCULATING SYSTEM

The BLANKETROL II water circulating system includes the pump, operating reservoir, replenishing reservoir, water flow indicator, water filter, fittings, and all interconnecting tubing. To clean the circulating system: See Section 4-2. - SUGGESTIONS FOR PROTECTING THE RESERVOIR FROM BACTERIA AND DECONTAMINATION GUIDELINES.

SECTION 5. FIELD REPAIR/SERVICE OF THE BLANKETROL II UNIT

5-1. INTRODUCTION

This section describes the repair and service task maintenance personnel can complete in the field if a problem should occur. These tasks include servicing any of the following:

1. Celsius/Fahrenheit selector switch
2. Compressor overload protector
3. Compressor relay
4. Compressor starting capacitor
5. Control panel
6. Heater
7. Microprocessor board
8. On/off power switch
9. Power relay
10. Power supply board
11. Pump housing
12. Pump motor
13. Thermal disc for temperature safety device
14. Upper and lower water manifolds
15. Water filter assembly
16. Water flow indicator
17. Water level sensor
18. Water temperature sensor

Additional tasks include checking the refrigerant flow and checking current leakage.

The description of each task includes the tools, the procedures, and the precautions necessary to complete the task. Maintenance, repair, and/or service of the BLANKETROL II by qualified maintenance/technical personnel will not void the warranty of the unit.

Figures (5-1), (6-2), and (6-4) highlight the interior components of the BLANKETROL II unit. The internal components referenced in Figure (5-1) are as follows:

- A. Upper manifold (return)
- B. Water temperature sensor
- C. Lower manifold (outlet)
- D. Pump housing assembly
- E. Transformer
- F. Compressor
- G. Compressor electrical box
- H. Filter drier
- I. Refrigeration solenoid valve
- J. Starting capacitor
- K. Refrigeration sight glass
- L. Condenser fan blade
- M. Hot gas by-pass valve
- N. Transformer circuit breaker
- O. Electrical box
- P. Water filter assembly
- Q. 800 watt heater
- R. Thermal disc
- S. Reservoir

If any part that is removed from the unit is still under warranty, return it to the factory as described in Section (6). If it is not under warranty, dispose of the part as required.

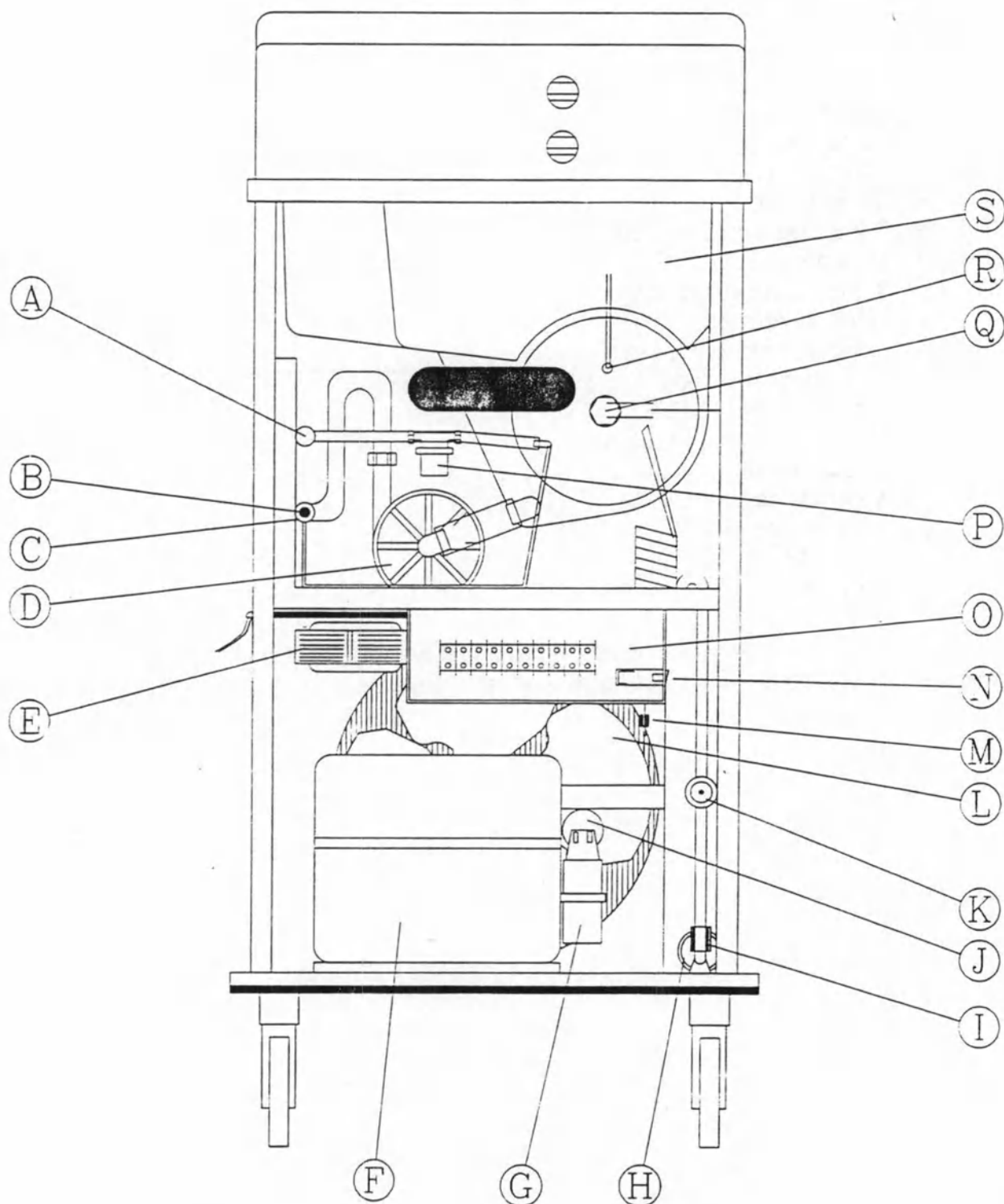


FIGURE 5-1 BLANKETROL II EXPOSED REAR VIEW

5-2. ACCESS TO THE INTERIOR OF THE BLANKETROL II UNIT

All internal operating components are readily accessible by either removing the rear enclosure panel, removing the top of the unit, or extending the front storage drawer.

NOTE: DRAIN THE RESERVOIR AND DISCONNECT THE POWER CORD FROM THE POWER SOURCE BEFORE REMOVING ANY PART FROM THE UNIT.

5-2.1. REMOVING THE REAR ENCLOSURE PANEL**CAUTION**

BE SURE THAT THE UNIT IS UNPLUGGED FROM THE POWER SOURCE

- A. Remove the four Phillips screws, one in each corner.
- B. Guide the panel outward and downward from the bottom so that the tab along the top edge of the panel clears the bottom edge of the top assembly.
- C. Set the enclosure panel and screws to a side.

5-2.2. REPLACING THE REAR ENCLOSURE PANEL**CAUTION**

BE SURE THAT THE UNIT IS UNPLUGGED FROM THE POWER SOURCE

- A. Guide the panel upward so that the tab catches behind the bottom edge of the top assembly.
- B. Insert and tighten the four Phillips screws.

5-2.3. REMOVING THE TOP OF THE UNIT

CAUTION

Working with electronic boards, plugs, and cables require delicate handling. Proper Electro Static Discharge, (ESD), handling procedures should be followed during replacement of any electronic board. It is recommended that this section be read in its entirety before removing the power supply board, and/or the microprocessor board, and/or the control panel. Section (6-5) describes the exchange policy for the microprocessor board, power supply board, and the control panel.

CAUTION

BE SURE THAT THE UNIT IS UNPLUGGED FROM THE POWER SOURCE

- A. Carefully pry off the caps of the two screws on the left side and right side of the unit.
- B. Remove the four Phillips screws.
- C. Carefully lift up the front edge of the top of the unit so that you can see the power supply board and two power relays secured to the top of the unit. The microprocessor board is attached to the top assembly. There is a 24 pin ribbon cable and a multicolored 6 pin power cord cable secured between the power supply board and the microprocessor board.
- D. Ensure that no water drips on the electrical components.

After the screws on the side of the unit are removed and the top is lifted, there are two ways to disconnect the top from the base depending upon what part is to be replaced.

If work is to be done with the power supply board, the power relays, the low water sensor device or anything related to the base of the unit, disconnect the cables from the power supply board. Go to Section (5-2.4.).

If work is to be done with the microprocessor board, the control panel, or anything related to the top assembly, disconnect the cables from the microprocessor board. Go to Section (5-2.5.).

5-2.4. DISCONNECTING THE CABLES FROM THE POWER SUPPLY BOARD**CAUTION****BE SURE THAT THE UNIT IS UNPLUGGED FROM THE POWER SOURCE**

- A. Locate the 24-pin dip socket on the power supply board where the 24 pin ribbon cable is attached. Cut the tie wrap holding the ribbon cable in the 24 pin dip socket.
- B. Disconnect the 24 pin ribbon cable by inserting a small flat edge screwdriver between it and the 24 pin dip socket. Gradually work the screwdriver towards the back so that the male plug lifts VERTICALLY.

NOTE: DO NOT BEND ANY OF THE PRONGS.

- C. Locate the 6-pin power cable connector on the power supply board where the multi-colored 6-pin power cable is attached.
- D. Disconnect the connector by pinching together the back and front of the connector and lifting up. The female plug disconnects from the male plug.
- E. The top of the unit may now be removed from the base.

NOTE: DO NOT DAMAGE THE PLUGS AT THE END OF THE CABLES.**5-2.5. DISCONNECTING THE CABLES FROM THE MICROPROCESSOR BOARD****CAUTION****BE SURE THAT THE UNIT IS UNPLUGGED FROM THE POWER SOURCE**

- A. While lifting the front edge of the top of the unit, locate the 6-pin power cable connector in the back left corner of the microprocessor board where the multi-colored 6-pin power cable is attached.
- B. Disconnect the connector by pinching together the front and back and pulling downward. The male plug disconnects from the female socket. Set the cable to one side.

NOTE: TIE WRAPS MUST BE CUT AND REINSTALLED ON 24 PIN CONNECTOR

- C. Locate the 24-pin dip socket on the microprocessor board where the 24-pin ribbon cable is attached.
- D. Disconnect the 24-pin ribbon cable by inserting a small flat edge screwdriver between it and the 24-pin dip socket. The male plug disconnects from the female socket. Gradually work the screwdriver towards the back so that the male plug lifts VERTICALLY.

NOTE: DO NOT BEND ANY OF THE PRONGS.

- E. The top of the unit may now be removed from the base.

5-2.6. REPLACING THE TOP OF THE UNIT AND THE CABLES TO THE POWER SUPPLY BOARD AND/OR TO THE MICROPROCESSOR BOARD

- A. Position the top of the unit over the base so that the back edge of the top rests on the back edge of the base and the front edge of the top is tilted up.
- B. Locate the multi-colored 6-pin power cable.
- C. Position the 6-pin female connector over the 6-pin male connector on the board. The connectors can be inserted in only one way; check that the grooves are aligned.
- D. Push the plugs together until they snap in place.
- E. Locate the 24-pin ribbon cable.
- F. Position the prongs of the 24-pin ribbon cable over the holes of the 24-pin dip socket on the board.
- G. **CAREFULLY** insert the male plug into the female socket.

NOTE: TIE WRAPS MUST BE CUT AND REINSTALLED ON 24 PIN CONNECTOR

NOTE: DO NOT BEND ANY OF THE PRONGS.

- H. Lower the front edge of the top of the unit.
- I. Insert and tighten the four screws on the left and right side of the unit.
- J. Push the caps over the screw heads.

5-2.7. EXTENDING THE FRONT STORAGE DRAWER

- A. Open the front storage drawer.
- B. Locate the 8-32 phillips head screw on the right inside edge of the drawer. Number 6 in Figure (6-4).
- C. Using a phillips head screwdriver, remove the 8-32 screw and set it aside.
- D. Tilt the drawer all the way down to expose the front interior of the unit.

5-2.8. REPOSITIONING THE FRONT STORAGE DRAWER

- A. Close the extended drawer all but one inch.
 - B. Insert and screw the 8-32 phillips head screw into place.
-

5-3. REPLACEMENT OF THE HEATER

- A. Collect the required tools:
 - 1. Drain hose
 - 2. 7/8" wrench
 - 3. Crimping tool, wire cutters, wire strippers (e.g. a pair of Super Champs)
 - 4. Teflon tape
 - 5. Two end-to-end wire connectors
 - 6. Replacement heater, contact the Service Department for appropriate replacement part
- B. Drain the reservoir as described in Section (4-2.1.).

CAUTION
BE SURE THAT THE UNIT IS UNPLUGGED FROM THE POWER SOURCE

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- C. Remove the rear enclosure panel as described in Section (5-2.1.).

The alarm sounds because the patient probe, as shown in Figure 5-10, is not properly inserted into the patient. The alarm sounds because the patient probe, as shown in Figure 5-10, is not properly inserted into the patient. The alarm sounds because the patient probe, as shown in Figure 5-10, is not properly inserted into the patient.

- E. Remove the black fiberglass tubing from the heater.

- F. Push back the black fiberglass tubing to expose three-four inches of the lead wires.

- G. Cut both wires approximately three inches from the heater.

- H. Catch and anchor to one side the cut wires so that the wires aren't lost in the black fiberglass tubing.

The alarm sounds because the patient probe, as shown in Figure 5-10, is not properly inserted into the patient. The alarm sounds because the patient probe, as shown in Figure 5-10, is not properly inserted into the patient.

- J. Cut the lead wires of the replacement heater to approximately four inches.

The alarm sounds because the patient probe, as shown in Figure 5-10, is not properly inserted into the patient. The alarm sounds because the patient probe, as shown in Figure 5-10, is not properly inserted into the patient.

- M. Strip each of the ends of the four lead wires (two from the replacement heater, two from the original heater) to expose approximately one inch of wire.

The alarm sounds because the patient probe, as shown in Figure 5-10, is not properly inserted into the patient. The alarm sounds because the patient probe, as shown in Figure 5-10, is not properly inserted into the patient.

The alarm sounds because the patient probe, as shown in Figure 5-10, is not properly inserted into the patient. The alarm sounds because the patient probe, as shown in Figure 5-10, is not properly inserted into the patient.

- P. Connect the remaining wire from the heater to the remaining wire from the electrical box.

The alarm sounds because the patient probe, as shown in Figure 5-10, is not properly inserted into the patient. The alarm sounds because the patient probe, as shown in Figure 5-10, is not properly inserted into the patient.

- S. Replace the rear enclosure panel as described in Section (5-2.2.).

described in Section (4-2.2.).

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GENERAL PREPARATION

- U. Complete the applicable parts of the First Time Set-Up/System Test Routine described in Section (2-3.) to determine that the heater is warming the water.

5-5. REPLACEMENT OF THE PUMP HOUSING

- A. Obtain a replacement pump housing.
- B. Drain the reservoir as described in Section (4-2.1.).

CAUTION**BE SURE THAT THE UNIT IS UNPLUGGED FROM THE POWER SOURCE**

- C. Remove the rear enclosure panel as described in Section (5-2.1.).
- D. Locate the white pump housing assembly and the inlet and outlet hose connections at the center left of the back of the unit as shown in Figure (5-1-D).
- E. Disconnect the hose at the inlet of the pump housing by loosening the screw clamp. Be careful: there may be water in the hose.
- F. Disconnect the hose at the outlet of the pump housing by loosening the screw clamp near the top of the white pump housing.
- G. Using a Phillips screwdriver, remove the four screws around the edge of the pump housing. Be careful: there may be water in the housing assembly. Set the screws aside.
- H. Pull the complete pump housing forward and remove.
- I. Insert the replacement housing assembly. Position the housing so that the outlet is pointing upward and the screw holes are aligned.
- J. Reinsert the four screws around the edge of the housing.
- K. Tighten the screws in the following order: top, bottom, right, left. Do not tighten the screws sequentially.
- L. Reconnect the hose of the water manifold to the outlet at the top of the pump housing and tighten the screw clamp.
- M. Reconnect the hose of the water reservoir to the inlet at the center of the pump housing and tighten the screw clamp.
- N. If needed, clean the water filter as described in Section (4-3.).

- O. Refill the reservoir as described in Section (4-2.2.).
- P. Complete the applicable parts of the First Time Set-Up/System Test Routine in Section (2-3.) to determine that the pump is circulating the water. Check for leaks around the pump housing.
- Q. Replace the rear enclosure panel as described in Section (5-2.2.).

5-6. REPLACEMENT OF THE PUMP MOTOR

- A. Obtain a replacement pump motor.
- B. Drain the Reservoir as described in Section (4-2.1.).

CAUTION

BE SURE THAT THE UNIT IS UNPLUGGED FROM THE POWER SOURCE

- C. Remove the rear enclosure panel as described in Section (5-2.1.).
- D. Extend the front storage drawer as described in Section (5-2.7.).

Locate the white pump housing assembly with inlet and outlet hose connections at the center left of the rear of the unit as shown in Figure (5-1-D).
- E. Disconnect the hose at the inlet and the outlet of the pump housing by loosening the screw clamps. Be careful; there may be water in the lines.
- F. Using a 7/16" wrench, remove the bolts securing the pump motor to the divider pan in the unit. The bolts are accessible from the front of the unit if the front storage drawer is extended.
- G. Catch each Kep nut from the underside of the divider pan as each bolt is loosened. Set the nuts, bolts, and washers to a side.
- I. Using a 5/16" wrench, remove the two nuts from the faceplate of the electrical box and remove the faceplate from the two stand-offs. Set the nuts and faceplate to a side.
- J. Trace the three-wire cable from the pump motor to the electrical box. The cable enters the box from the right side.

- K. Locate the termination of the three wires. Reference the wiring diagram located on the electrical box.
- L. Disconnect and remove each of the wires from the electrical box. The white and black wires are terminated with slide-off connector. The green wire is terminated with an eyelet connector that is disconnected by unscrewing the ground screw.

NOTE: DO NOT TO DISTURB ANY OF THE OTHER WIRE CONNECTIONS.

- M. Remove the pump motor from the unit. Be sure to save the rubber gasket from beneath the pump motor.
- N. Replace the rubber gasket, aligning the holes of the gasket with the holes on the shelf of the unit.
- O. Position the replacement pump motor so that the holes of the motor align with the holes of the shelf and the pump housing faces the rear of the unit.
- P. Replace and tighten a washer, bolt and Kep nut in each of the holes of the pump motor base.
- Q. Thread the three-wire cable from the pump motor to the right side hole of the electrical box.
- R. Reconnect each wire to the correct terminal; the black wire to the 4th terminal from the left on the top row, the white wire to the 9th terminal from the left on the middle top row, and the green wire to the grounding screw in the lower right corner.
- S. Replace the faceplate of the electrical box; secure with the two 5/16" nuts.
- T. Reconnect the hose of the lower water manifold to the outlet at the top of the pump housing and tighten the screw clamp.
- U. Reconnect the hose of the water reservoir to the inlet at the center of the pump housing and tighten the screw clamp.
- V. Refill the reservoir as described in Section (4-2.2.).
- W. Complete the applicable parts of the First Time Set-Up/System Test Routine in Section (2-3.) to determine that the pump is circulating the water. Check for leaks around the pump housing.
- X. Reposition the front storage drawer as described in Section (5-2.8.).
- Y. Replace the rear enclosure panel as described in Section (5-2.2.).

5-7. REPLACEMENT OF THE WATER TEMPERATURE SENSOR

- A. Obtain replacement water temperature sensor.
- B. Drain the reservoir as described in Section (4-2.1.).

CAUTION**BE SURE THAT THE UNIT IS UNPLUGGED FROM THE POWER SOURCE**

- C. Remove the rear enclosure panel as described in Section (5-2.1.).
- D. Locate the water temperature sensor in the end of lower water manifold and 4-wire connector on the left side of the back of the unit as shown in Figure (5-1-B).
- E. Disconnect the water temperature sensor by pulling apart the plug.
- F. Using a 7/16" wrench, unscrew the nut of the water temperature sensor at the water manifold and remove the water temperature sensor. Be careful: there may be water in the line.
- G. Insert and tighten the replacement water temperature sensor into the lower water manifold. The threads of the replacement water temperature sensor are covered with teflon tape to insure a water-tight seal. Do not remove.
- H. Connect the water temperature sensor by inserting the plug.
- I. Refill the reservoir as described in Section (4-2.2.).
- J. Complete the applicable parts of the First Time Set-Up/System Test Routine in Section (2-3.) to determine that the sensor is working. Check for leaks around the sensor.
- K. Replace the rear enclosure panel as described in Section (5-2.2.).

5-8. REPLACEMENT OF THE UPPER AND/OR LOWER WATER MANIFOLDS

- A. Collect the required tools:
1. Drain hose
 2. 7/16" and 9/16" wrench and screwdriver
 3. Teflon tape
 4. Plastic tie wraps
 5. Obtain replacement manifolds as needed.
- B. Drain the reservoir as described in Section (4-2.1.).

CAUTION**BE SURE THAT THE UNIT IS UNPLUGGED FROM THE POWER SOURCE**

- C. Remove the rear enclosure panel as described in Section (5-2.2.).
- D. Locate the copper water manifold to be replaced. The two manifolds, one lower and one upper, are wrapped in black foam and are secured to the left side (viewed from the rear) of the unit as shown in Figure (5-1-A & C). The lower manifold is connected to the male Hansen fittings and to the hose from the pump. The water temperature sensor is inserted in the end of the lower manifold. The by-pass at the other end of the lower manifold connects to the water reservoir. The upper manifold is connected to the female Hansen fittings and to the hose to the water flow indicator. To replace the lower manifold, continue to Step E. To replace the upper manifold, go to Step R.
- E. Remove the water temperature sensor as described in Section (5-7.), Steps D - F. Set to one side.
- F. Disconnect the hose at the copper elbow of the lower manifold by loosening the screw clamp. Be sure to exercise caution there may be water in the line.
- G. Using a 9/16" wrench, unscrew and remove the three male Hansen fittings from the outside of the unit.
- H. Disconnect the by-pass line from the reservoir. Remove the clamp from the clear plastic bypass line and disconnect the by-pass line.

5-7. REPLACEMENT OF THE WATER TEMPERATURE SENSOR

- A. Obtain replacement water temperature sensor.
- B. Drain the reservoir as described in Section (4-2.1.).

CAUTION**BE SURE THAT THE UNIT IS UNPLUGGED FROM THE POWER SOURCE**

- C. Remove the rear enclosure panel as described in Section (5-2.1.).
- D. Locate the water temperature sensor in the end of lower water manifold and 4-wire connector on the left side of the back of the unit as shown in Figure (5-1-B).
- E. Disconnect the water temperature sensor by pulling apart the plug.
- F. Using a 7/16" wrench, unscrew the nut of the water temperature sensor at the water manifold and remove the water temperature sensor. Be careful: there may be water in the line.
- G. Insert and tighten the replacement water temperature sensor into the lower water manifold. The threads of the replacement water temperature sensor are covered with teflon tape to insure a water-tight seal. Do not remove.
- H. Connect the water temperature sensor by inserting the plug.
- I. Refill the reservoir as described in Section (4-2.2.).
- J. Complete the applicable parts of the First Time Set-Up/System Test Routine in Section (2-3.) to determine that the sensor is working. Check for leaks around the sensor.
- K. Replace the rear enclosure panel as described in Section (5-2.2.).

- W. Connect the hose from the water flow indicator to the copper elbow and tighten the screw clamp.
- X. Refill the reservoir as described in Section (4-2.2.).
- Y. Complete the applicable parts of the First Time Set-Up/System Test Routine in Section (2-3.) to determine that the water is circulating. Check for leaks around the Hansen fitting outlets and returns and around the hose connections.
- Z. Replace the rear enclosure panel as described in Section (5-2.2.).

5-9. REPLACEMENT OF THE COMPRESSOR STARTING CAPACITOR, THE OVERLOAD PROTECTOR, AND/OR THE COMPRESSOR RELAY

NOTE: For replacement of these parts call CSZ Technical Service.

5-10. REPLACEMENT OF THE THERMAL DISC FOR THE TEMPERATURE SAFETY DEVICE

- A. Obtain a replacement thermal disc.

CAUTION

BE SURE THAT THE UNIT IS UNPLUGGED FROM THE POWER SOURCE

- B. Remove the rear enclosure panel as described in Section (5-2.1.).
- C. Locate the thermal disc on the reservoir plate in the twelve o'clock position and the lead wires to the power supply as shown in Figure (5-1-S).
- D. Push back or cut back the black insulation.
- E. Disconnect the two slide-on connectors.
- F. Using a Phillips screwdriver remove the two screws at the top and bottom of the thermal disc.
- G. Remove the thermal disc.
- H. Install the replacement thermal disc.

- I. Carefully work the lower manifold from the holes on the side of the unit and withdraw it from the back of the unit.
- J. Insert the replacement lower manifold so that the three outlets align with the three holes on the side of the unit, the outlet for the water temperature sensor points to the back of the unit, the copper elbow points toward the front of the unit and the clear plastic by-pass line runs from the front of the unit toward the reservoir. Appropriately apply teflon tape to all threaded connections.
- K. Reconnect the three male Hansen fittings on the bottom row starting with the fitting farthest from the water flow indicator. Check that the fittings are tight.
- L. Connect the hose from the pump housing to the copper elbow of the manifold and tighten the clamp.
- M. Remove the used white teflon tape from around the threads of the water temperature sensor. Apply new teflon tape.
- N. Reinsert the water temperature sensor as described in Section (5-7.), Steps G and H.
- O. Insert the by-pass tubing into the copper tube from the reservoir.
- P. Secure the clear plastic tube with the plastic "snapper" clamp.

To Replace the upper manifold, continue to Step Q. To Replace only the lower manifold, go to Step Z.

- Q. Disconnect the hose at the copper elbow of the upper manifold by loosening the screw clamp. Be careful: there may be water in the line.
- R. Using a 9/16" wrench, unscrew and remove the three female Hansen fittings from the outside of the unit. Set to one side.
- S. Carefully work the manifold from the holes on the side of the unit and remove it from the back of the unit.
- T. Apply teflon tape around the threaded nipples of the replacement manifold.
- U. Insert the replacement upper manifold so the three nipples align with the three holes on the side of the unit and the copper elbow points toward the front of the unit.
- V. Reconnect the three female Hansen fittings on the top row starting with the fitting farthest from the water flow indicator. Check that the fittings are screwed tight.

- H. Remove the four remaining Phillips head screws around the face of the water flow indicator. Set the screws to the side.
 - I. Disassemble the parts of the water flow indicator. Do not lose the large black O-ring.
 - J. Rinse thoroughly with clean water. A small brush may be used to clean the parts.
 - K. Reassemble the parts.
 - L. Reinsert the four screws.
 - M. Position the replacement water flow indicator inside the unit so that the screw holes are aligned on the right side wall and the plastic elbows point toward the back of the unit.
 - N. Insert and tighten the two Phillips head screws from the outside.
 - O. Connect the hose from the upper manifold to the top plastic elbow and tighten the clamp.
 - P. Connect the hose from the water filter to the bottom plastic elbow and tighten the clamp.
 - Q. Refill the water reservoir as described in Section (4-2.2.).
 - R. Complete the applicable parts of the First Time Set-Up/System Test Routine described in Section (2-3.) to determine that the water is circulating. Check for leaks around the water flow indicator.
 - S. Reposition the front storage drawer as described in Section (5-2.8).
-

- I. Replace and tighten the two screws.
- J. Insert the piggyback slide-on connector to the insulated terminal (white wire) of the thermal disc. Insert the other slide-on connector to the insulated terminal (orange wire) of the thermal disc.

NOTE: FIBERGLASS TUBING AND THE WRAPS ARE SUPPLIED WITH EACH THERMAL DISC FOR COMPLETE INSTALLATION.

- K. Reposition the black insulation foam.
- L. Replace the rear enclosure panel as described in Section (5-2.2.).
- M. Complete the applicable parts of the First Time Set-Up/System Test Routine described in Section (2-3.) to determine that the unit is operating.

5-11. REPLACEMENT OR CLEANING OF THE WATER FLOW INDICATOR ASSEMBLY

- A. Obtain a replacement water flow indicator.
- B. Drain the reservoir as described in Section (4-2.1.).

CAUTION

BE SURE THAT THE UNIT IS UNPLUGGED FROM THE POWER SOURCE

- C. Extend the front storage drawer as described in Section (5-2.7.).
- D. Locate the white, square water flow indicator assembly (number 15 in Figure 6-2) attached to the right side (front view) wall, the connecting hose at its top and the connecting hose at its bottom.
- E. Disconnect the hose at the top of the water flow indicator by loosening the screw clamp. Be careful; there may be water in the line.
- F. Disconnect the hose at the bottom of the water flow indicator by loosening the screw clamp. Be careful; there may be water in the line.
- G. Using a Phillips screwdriver, remove the two screws that hold the water flow indicator to the manifold pan on the outside right wall. Catch the water flow indicator as it falls to the inside. If the water flow indicator is to be replaced, go to Step M. If the water flow indicator is to be cleaned and then reinserted, go to Step H.

5-13 REPLACEMENT OF THE CELSIUS/FAHRENHEIT SELECTOR SWITCH

- A. Obtain a replacement Celsius/Fahrenheit switch.

CAUTION

BE SURE THAT THE UNIT IS UNPLUGGED FROM THE POWER SOURCE

- B. Extend the front storage drawer as described in Section (5-2.7.).
- C. Locate the rectangular selector switch on the right side of the front panel of the unit. Number 16 in Figure (6-2).
- D. Work the selector switch and attached cable to the outside of the unit by pressing together the tension clips on the top and bottom of the switch assembly. The tension clips are accessible by reaching inside the unit from the extended drawer opening.
- E. Disconnect the two slide-on connectors from the switch (one is a piggy-back spade connector).
- F. Examine the back of the replacement switch. There is one copper-colored and one silver-colored terminal prong.
- G. Connect each slide-on connector to the correct terminal of the replacement selector switch. The yellow wire connects at the copper-colored terminal and the two white wires with the piggy-back connector connects to the silver-colored terminal.
- H. Position the replacement selector switch into the unit so that the yellow wire is above the white wires. (Fahrenheit is indicated when the rocker switch is pressed upwards.)
- I. Complete the applicable parts of the First Time Set-Up/System Test Routine described in Section (2-3.) to determine that the unit is operating.
- J. Reposition the front storage drawer as described in Section (5-2.8.).

5-14. REPLACEMENT OF A THREE POLE POWER RELAY

- A. Obtain a replacement 3-pole power relay.

CAUTION**BE SURE THAT THE UNIT IS UNPLUGGED FROM THE POWER SOURCE**

- B. Remove the top of the unit. Disconnect the cables from the power supply board as described in Section (5-2.3.).
- C. Locate the power relay to be replaced. Facing the unit, the two power relays are in the right back corner inserted in gray sockets, number 6 in Figure (6-2).
- D. Grasp the relay to be replaced and pull upward.
- E. Position the replacement relay over the socket and push downward. The relay can be inserted in only one way.
- F. Replace the top of the unit as described in Section (5-2.6.).
- G. Complete the applicable parts of the First Time Set-Up/System Test Routine described in Section (2-3.) to determine the unit is operating.

5-15. REPLACEMENT OF THE WATER LEVEL SENSOR ASSEMBLY

- A. Obtain a replacement water level sensor.
- B. Drain the reservoir as described in Section (4-2.1.).

CAUTION**BE SURE THAT THE UNIT IS UNPLUGGED FROM THE POWER SOURCE**

- C. Remove the top of the unit as described in Section (5-2.3.) disconnecting the cables from the power supply board.
- D. Locate the water level sensor. Facing the unit, it is a square plate located in the center of the unit with two red wires leading to a 2-pin connector. Number 19 in Figure (6-2).
- E. Disconnect the water level sensor by pulling apart the white, 2-pin connector.

- F. Using a 5/16" wrench, remove the four nuts from the screw posts in the four corners of the water level sensor. Set the nuts to one side.
- G. Remove the water level sensor by lifting upward.
- H. Remove the black rubber gasket from the defective water level sensor and insert the gasket on the replacement water level sensor.
- I. Insert the replacement water level sensor with the gasket into the hole so that the screw holes are aligned with the four screwposts.
- J. Replace and tighten the four nuts on the screwposts.
- K. Reconnect the white 2-pin connector.
- L. Replace the top of the unit as described in Section (5-2.6.).
- M. Refill the reservoir as described in Section (4-2.2.).
- N. Complete the applicable parts of the First Time Set-Up/System Test Routine in Section (2-3.) to determine that the water level sensor is operating.

5-16. REPLACEMENT OF THE POWER SUPPLY BOARD

CAUTION

Working with electronic boards, plugs, and cables require delicate handling. Proper Electro Static Discharge, (ESD), handling procedures should be followed during replacement of any electronic board. It is recommended that this section be read first before removing the power supply board. Section (6-5) describes the exchange policy for the power supply board.

- A. Obtain the required replacement power supply board.
- B. Drain the reservoir as described in Section (4.2.1.).

CAUTION

BE SURE THAT THE UNIT IS UNPLUGGED FROM THE POWER SOURCE.

- C. Remove the top of the unit as described in Section (5-2.3.) disconnecting the cables from the power supply board. Set the top to one side.

- D. Looking from the back of the unit, locate the power supply board secured to the unit, the connector on the right side, and the two connectors on the left side of the board. Number 7 in Figure (6-2).
 - E. Disconnect each of the connectors by grasping and pressing the left and right side of the plug and working the plug outward.
 - F. Using a 5/16" wrench remove the four nuts in the corners of the board.
 - G. Carefully lift the power supply board straight up. DO NOT DISTURB any of the board components.
 - H. Set the power supply board aside.
 - I. Position the replacement power supply board on the four screw posts. DO NOT DISTURB any of the board components.
 - J. Replace and tighten the star washers and nuts on screw stand-offs.
 - K. Reconnect each of the multiple pin connectors.
 - L. Replace the top of the unit as described in Section (5-2.6.).
 - M. Refill the reservoir as described in Section (4-2.2.).
 - N. Complete the applicable parts of the First Time Set-Up/System Test Routine in Section (2-3.) to determine the power supply board is operating.
-

5-17. REPLACEMENT OF THE MICROPROCESSOR BOARD AND/OR THE CONTROL PANEL**CAUTION**

Working with electronic boards, plugs, and cables require delicate handling. Proper Electro Static Discharge, (ESD), handling procedures should be followed during replacement of any electronic board. It is recommended that this section be read first before removing the microprocessor board and/or the control panel. Section (6-5) describes the exchange policy for the microprocessor board and the control panel.

Access to the control panel requires first removing the microprocessor board.

- A. Obtain the required replacement part: microprocessor board and/or control panel.
- B. Drain unit as described in Section (4-2.1.).

CAUTION

BE SURE THAT THE UNIT IS UNPLUGGED FROM THE POWER SOURCE.

- C. Remove the top of the unit as described in Section (5-2.3.) disconnecting the cables from the microprocessor board.
- D. Position the top of the unit at a work space, face down.
- E. Locate the 2-pin connector of the cable from the probe jack to the microprocessor board. Disconnect the plug by pinching together the sides and lifting upward.
- F. Using a 5/16" wrench remove the six nuts and star washers from around the edge of the board.
- G. Gently lift the microprocessor board; it is still connected to the control panel by a 9-pin slide-on connector along the top edge of the board on the underside.
- H. Disconnect the 9-pin connector and remove the board.
- I. Carefully set the microprocessor board aside.

If only the microprocessor board is to be replaced, go to Step M. If the control board is to be replaced, go to Step J.

- J. Using a 1/4" wrench, remove the six stand-offs and six washers. Remove the control panel from the top assembly.
 - K. Appropriately insert the replacement control panel into the top assembly, and resecure standoffs.
 - L. Position the microprocessor board along the edge inside the top so the yellow, red and green LED's will be face down and the clear 9-pin strip cable aligns with the 9-pin slide connector.
 - M. Connect the cable to the 9-pin connector.
 - N. Set the microprocessor board on the six screw posts.
 - O. Replace the six star washers and six nuts; tighten the nuts.
 - P. Reconnect the 2-pin connector of the cable from the probe jack. The plug can be inserted in only one way; check that the grooves are aligned.
 - Q. Reposition the top on the unit and reconnect the cables as described in Section (5-2.6.).
 - R. Refill the water reservoir as described in Section (4-2.2.).
 - S. Complete the applicable parts of the First Time Set-Up/System Test Routine described in Section (2-3.) to determine the unit is operating.
-

5-18. LEAKAGE CURRENT

The BLANKETROL II unit should periodically be checked for Leakage Current prior to general floor use. Using an electrical safety analyzer, measure the electrical Leakage Current under the following conditions: Power ON & Off, polarity normal and reverse, unit grounded and ungrounded. The Leakage Current should be less than 300 microamps under all conditions for 100/115 volt. The Leakage Current should be less than 500 microamps under all conditions for 230/240 volt. If a BLANKETROL II unit has Leakage Current that exceeds 300 microamps in the 100/115V unit or has a significant increase in Leakage Current, the cause should be investigated and individual components of the unit must be electrically isolated and measured. All readings may be affected by the age of the components, ambient temperature, and humidity, contact the CSZ Service Department.

5-18.1. ARRANGING THE EQUIPMENT

- A. Plug the BLANKETROL II power cord into a Leakage Current tester and plug the tester into a power source.
- B. Attach the input leadwire of the tester to a grounding point of the BLANKETROL II unit.
- C. Attach the other leadwire of the tester to a ground for the whole system.

5-18.2. TAKING MEASUREMENTS IN NORMAL POLARITY

- A. Set the tester to Normal Polarity.
- B. Push the power switch of the BLANKETROL II unit to the ON position and record the Leakage Current.
- C. Set the BLANKETROL II unit so it is COOLING and record the Leakage Current.

To set the unit in the Cooling Cycle:

1. Press the power switch to the ON position.
2. Press the TEMP SET Switch.
3. Press the DOWN arrow so the SETPOINT is a low number.
4. Press the MANUAL CONTROL switch.

The Status display must show **COOLING**.

- D. Set the BLANKETROL II unit so that it is HEATING and record the Leakage Current.

To set the unit in the heating cycle:

1. Press the power switch to the ON position.
2. Press the TEMP SET switch.
3. Press the UP arrow so the SETPOINT is a high number.
4. Press the MANUAL CONTROL switch.

The Status display must show **HEATING**.

5-18.3. TAKING MEASUREMENTS IN REVERSE POLARITY

- A. Set the tester to Reverse Polarity.
- B. Press the power switch of the BLANKETROL II unit to the ON position and record the Leakage Current.
- C. Set the BLANKETROL II unit so that it is COOLING and record the Leakage Current.
- D. Set the BLANKETROL II unit so that it is HEATING and record the Leakage Current.

5-19. REFRIGERANT CHECK

The BLANKETROL II unit cooling system includes a sight glass to check the refrigerant flow.

For best operation, the system should have a full flow and a dry system.

The center dot of the sight glass should be a pale green at all times to indicate a dry system. A yellow dot indicates a moist system and a possible leak. When the unit is operating in the cooling cycle, the sight glass should be full with no bubbles. This can be checked by setting the unit to operate in the Manual Control Mode so that the Status display shows cooling and watching the liquid fill-up the sight glass. During this check, there must be at least 2°C (4°F) difference between the SETPOINT temperature and the BLANKET/WATER temperature. If the temperatures are set closer, the sight glass may show churning bubbles or be only half full.

NOTE: THE CHECK MUST BE DONE ONLY WHEN THE UNIT OPERATES IN THE COOLING CYCLE.

Bubbles in the sight glass may indicate a shortage of refrigerant and a probable leak.

If there is less than full flow, a qualified refrigeration technician should charge the unit until a full flow is attained. DO NOT OVERCHARGE. The system charge is approximately 13 ounces of R134A. Only a qualified refrigeration technician should repair a refrigeration leak, contact CSZ service department.

5-20. LOW LIMIT SAFETIES CHECK

- A. Remove the four capped screws and lift the top carefully. (DO NOT DISCONNECT ANY WIRES.)
- B. Remove the white/yellow wire from the rear (upper) terminal of the 3 pole (K-4) relay socket. Insulate this wire to insure it will not short against any other terminals or metal parts.
- C. Attach a 16 gauge wire approximately 7" long (stripped at one end and with an alligator clip on the other end) to terminal #1 of the 3 pole relay socket (K-4) and to the slide on terminal of the bridge rectifier where the white/blue wire is connected.
- D. Due to the "test wiring" being installed, the unit will cool down to $3^{\circ}\text{C} \pm 1^{\circ}\text{C}$ ($37^{\circ}\text{F} \pm 2^{\circ}\text{F}$). At this point the audible alarm will sound, the status display will indicate LOW-TEMP and the refrigeration solenoid will be de-energized. The LOW TEMP alarm will resound at one (1) minute intervals when the silence alarm key is pressed. It will be necessary to silence this alarm for the duration of the LOW TEMP/LOW LIMIT safeties check.

NOTE: THE LOW TEMP ALARM IS THE MICROPROCESSOR BOARD'S BEEPER.

- E. Even though the refrigeration solenoid has been de-energized via the microprocessor due to the "test wiring" being installed, the unit will continue to cool down to $1^{\circ}\text{C} \pm 1^{\circ}\text{C}$ ($34^{\circ}\text{F} \pm 2^{\circ}\text{F}$). At this point, the audible alarm will sound, the status display will indicate REMOVE FROM SERVICE, LOW LIMIT and the unit must be unplugged from its power source.

NOTE: THE LOW LIMIT ALARM IS THE SONALERT CHIME LOCATED NEAR THE COMPRESSOR.

NOTE: BETWEEN THE LOW-TEMP AND LOW-LIMIT ALARMS, THE REFRIGERATION MAY SLOW DOWN DUE TO THE HOT GAS BYPASS VALVE.

- F. Reconnect the white/yellow wire to its proper terminal and tighten. Remove the 16 gauge wire from terminal #1 of the 3 pole (K-4) relay socket and tighten the terminal. Remove the other end of this wire from the slide on terminal of the bridge rectifier where the white/blue wire is connected.

NOTE: MAKE SURE ALL WIRES ARE IN THE PROPER POSITION AND ALL CONNECTIONS ARE TIGHTENED.

- G. Put the top back on and reinstall the four capped screws.

NOTE: THE REAR PANEL MUST BE ON THE UNIT DURING THIS TEST.

5-21. HIGH LIMIT SAFETIES CHECK

- A. Remove the four capped screws and lift the top carefully. (DO NOT DISCONNECT ANY WIRES.)
- B. Remove the 3 pole relay (K-4) from the socket. It is located to the right of the power supply board.
- C. Use at least a #16 gauge jumper wire three to four inches long and stripped at both ends. Attach one end to the yellow wire on the front (lower) terminal of the 3 pole (K-4) relay socket. Attach the other end to the brown wire on the front (lower) terminal of the 3 pole (K-3) relay socket. The unit is wired so the heater stays on.
- D. Plug the unit in and turn the power switch to the ON position. Set the SETPOINT at least 2°C (4°F) below the blanket/water temperature and start the unit in the manual mode. The status display will indicate "COOLING" but the unit will be heating. The primary High Limit Safety (electronic) will activate at 44.6°C ± 2°C (112°F ± 4°F). When the unit reaches the 44.6°C ± 2°C (112°F ± 4°F) Primary High Limit Safety, the red indicator light will go out, the status display will flash HI TEMP, and the ALARM will sound. In normal operation, the heater will also be off at this point.

NOTE: THE HIGH TEMP ALARM IS THE MICROPROCESSOR BOARD'S BEEPER.

- E. Because of by-passing the Primary High Limit, the unit will continue to heat until it reaches the Secondary High Limit Safety (thermostat). This will occur at $46^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ($115^{\circ}\text{F} \pm 4^{\circ}\text{F}$) and the unit will indicate - REMOVE FROM SERVICE. It will show HI LIMIT in the status display and the alarm will sound. Turn the power switch to the OFF position and unplug the unit.

NOTE: *THE HI LIMIT ALARM IS THE SONALERT CHIME LOCATED NEAR THE COMPRESSOR.*

- F. Remove the jumper wire and reinstall the 3 pole relay.

NOTE: *MAKE SURE ALL WIRES ARE IN THE PROPER POSITION AND THAT ALL CONNECTIONS ARE TIGHTENED. PUT THE TOP ON AND REINSTALL THE FOUR CAPPED SCREWS.*

- G. The unit will stay in the HI LIMIT condition until the thermostat automatically resets itself. Draining the unit and/or replenishing it with cold water will speed the reset of the thermostat.

DANGER

The repair, calibration, and servicing of the BLANKETROL II should be performed by qualified medical equipment Service Technicians, certified Biomedical Electronics Technicians, or Certified Clinical Engineers familiar with good repair practices for servicing medical devices, and in accordance with instructions contained in this manual. **Improper repair can result in damage to the BLANKETROL II system and patient injury.**

CAUTION

Working with electronic boards, plugs, and cables require delicate handling. Proper Electrostatic Discharge (ESD) handling procedures should be followed while working with any of the above components. It is recommended that this section be read first before approaching any of the tasks in the "Action to be Taken" column.

5-22. TROUBLESHOOTING GUIDE

OBSERVATION	POSSIBLE PROBLEM	ACTION TO BE TAKEN
A. The power switch of the BLANKETROL II unit is set "ON" but does not light, control panel is blank.	Unit is unplugged	Check that the power cord (3-prong plug for 115/100 VAC units and appropriate ground plug for 230/240 VAC units) is plugged into a properly grounded hospital grade receptacle.
	No line voltage	Check for possible short in electrical system.
B. Each time the BLANKETROL II unit is set "ON", it snaps to the "OFF" position.	The circuit breaker built into the power switch is tripped.	Check amperage at switch. a. If the amp reading is less than 15 amperes, the circuit breaker may be defective. b. If the amp reading is greater than 15-20 amperes, check the amp reading of the compressor and the heater. c. Check for short in unit.
	Defective bridge rectifier	Replace bridge rectifier.
C. The power switch is set "ON" and lights up green, but the control panel is blank/inoperable.	The transformer circuit breaker at the electrical box is tripped.	Reset the circuit breaker. If it continues to trip, replace circuit breaker or transformer.
	The cable(s) between the power board and the micro-processor board are disconnected.	Reconnect the 6-pin, and/or the 24-pin connector cable. See Section 5-2.6.

5-22. TROUBLESHOOTING GUIDE

OBSERVATION	POSSIBLE PROBLEM	ACTION TO BE TAKEN
C. (Cont'd)	All three cables from the unit to the power board are disconnected. The 10-pin cable from the unit to the board is disconnected.	Reconnect the 10-pin, 10- and 6-pin connectors. See Section 5-16. Reconnect the 10-pin cable.
D. The power switch is set "ON" and lights up green. The Celsius/Fahrenheit indicator, and the Status display light but the switches are inoperable.	The 9-pin cable between the microprocessor board and control panel is disconnected.	Reconnect the 9-pin connector. See Section 5-17.
E. Unit is set "ON", a switch on the control panel is pressed but does not stay set, or when the operating mode is changed a switch remains set, or when the TEMP SET switch is pressed another switch snaps on.	Membrane switch has failed.	Replace control panel. See Section 5-17.
F. The unit is "ON". When the Celsius/Fahrenheit selector switch is pressed, the Celsius/ Fahrenheit indicator on the control panel does not change.	Celsius/ Fahrenheit selector switch has failed.	Replace switch. See Section 5-13.

5-22. TROUBLESHOOTING GUIDE

OBSERVATION	POSSIBLE PROBLEM	ACTION TO BE TAKEN
G. The unit in "ON". The unit alarm sounds and the <i>Status</i> display reads CK PROBE or LO WATER, but the <i>Silence</i> alarm switch does not stop the alarm.	The membrane switch has failed unless the REMOVE FROM SERVICE display also flashes.	Replace Control Panel. See Section 5-17.
H. When the TEST INDICATORS switch is pressed, a part of the display does not light.	LED has failed.	Replace Micro Board.

5-22. TROUBLESHOOTING GUIDE

OBSERVATION	POSSIBLE PROBLEM	ACTION TO BE TAKEN
I. Unit is "ON". When the TEST INDICATOR is pressed, the displays across the panel show an atypical pattern display, e.g. all 333's.	Microprocessor board malfunctions.	Replace microprocessor board. See Section 5-17.
J. The probe from the patient is inserted but when operating in the Automatic mode, the <i>Patient</i> display does not light up and alarm doesn't sound.	LED has failed. The SETPOINT TEMP is out of the range of 30°C to 40°C (86°F to 104°F) and the STATUS display is flashing check SETPOINT. The probe is defective, e.g., a broken internal wire. Status display flashes CK PROBE and sounds the alarm.	See Observation H. Go back to temp set and set desired patient temp between range of 30°C to 40°C (86°F to 104°F). Replace with a new 400 Series Probe.
	Cable from the probe jack to microprocessor board is disconnected, STATUS display flashes CK PROBE and the alarm sounds.	Reconnect cable. See Section 5-17.
	Probe jack on side of unit is defective, Status display flashes CK PROBE and the alarm sounds.	Replace the probe jack.

5-22. TROUBLESHOOTING GUIDE

OBSERVATION	POSSIBLE PROBLEM	ACTION TO BE TAKEN
K. The probe from the patient is inserted but when operating in <i>Manual or Monitor Only</i> modes, the <i>Patient</i> display does light up and alarm doesn't sound.	LED has failed. Other than a 400 Series probe was inserted in the probe jack.	See Observation H. Replace with the correct 400 Series probe.
L. The probe from the patient is inserted but when operating in the <i>Automatic</i> mode, the <i>Patient</i> display goes blank, alarm sounds, and the <i>Status</i> display reads CK PROBE.	Other than a 400 Series probe was inserted in the probe jack. The patient probe has become dislodged from the patient and sensing a temperature below 30°C (86°F).	Replace with the correct 400 Series probe. Reinsert probe into patient.
	The probe is defective, e.g.: a broken internal wire.	Replace probe with a new 400 Series probe.
	Cable from the probe jack to microprocessor board is disconnected.	Reconnect cable. See Section 5-17.
	Probe jack on side of unit is defective.	Replace probe jack assembly.
M. The unit is operating in one of the three modes and the <i>Patient</i> display shows an erratic display.	Patient probe is improperly attached to patient. The patient probe is defective.	Check the placement of the probe. See Section 3-2. Replace with a new 400 Series probe.

5-22. TROUBLESHOOTING GUIDE

OBSERVATION	POSSIBLE PROBLEM	ACTION TO BE TAKEN
M. (Cont'd)	Microprocessor board is defective.	Replace the microprocessor board. See Section 5-17.
N. The unit is operating in <i>Automatic</i> or <i>Manual</i> mode and the Blanket/Water display shows an erratic display.	Water temperature sensor is defective. Microprocessor board is defective.	Replace water temperature sensor. See Section 5-7. Replace the microprocessor board. See Section 5-17.
O. The unit is operating in one of the three modes, the unit momentarily blanks and then the <i>Status</i> display flashes CK SET PT.	Low line voltage or power source.	Check line voltage. Reset <i>Setpoint</i> display and resume operations.
P. The unit is operating in <i>Manual</i> or <i>Automatic</i> mode. When cycling to <i>Cool</i> mode, all displays flicker on and off, the unit goes to CK SET PT in the <i>Status</i> display or REMOVE FROM SERVICE SENSOR or HI LIMIT.	Low line voltage or power source.	Check line voltage. Reset <i>Setpoint</i> display and resume operations.

5-22. TROUBLESHOOTING GUIDE

OBSERVATION	POSSIBLE PROBLEM	ACTION TO BE TAKEN
Q. Unit is operating in <i>Automatic or Manual</i> mode, the <i>Status</i> display flashes HI LIMIT and REMOVE FROM SERVICE.	The back-up <i>High Limit Safety</i> device is triggered which shuts down the unit when the circulating water and reservoir reach $46^{\circ}\text{C} \pm 2^{\circ}\text{C}$ ($115^{\circ}\text{F} \pm 4^{\circ}\text{F}$) because:	
	Defective Control	Replace microprocessor board. See Section 5-17.
	Defective Thermal Disc	Replace thermal disc. See Section 5-10.
	Water not circulating because:	
	Clogged by-pass	Turn the unit OFF, force compressed air in the male outlets.
	Pump not working	See Observation W.
R. Unit is operating in <i>Automatic or Manual</i> mode, the <i>Status</i> display flashes LO LIMIT and REMOVE FROM SERVICE.	The back-up <i>Low Limit Safety</i> device is triggered which shuts down the unit when the circulating water reaches $1^{\circ}\text{C} \pm 1^{\circ}\text{C}$ ($34^{\circ}\text{F} \pm 2^{\circ}\text{F}$) because more than one of the following has occurred:	
	Defective Control	Replace microprocessor board. See Section 5-17.
	Defective water temperature sensor.	Replace water temperature sensor. See Section 5-7.

5-22. TROUBLESHOOTING GUIDE

OBSERVATION	POSSIBLE PROBLEM	ACTION TO BE TAKEN
R. (Cont'd)	Defective power board	Replace power supply board. See Section 5-16.
S. Unit operating in <i>Automatic</i> or <i>Manual</i> mode, the <i>Status</i> display flashes SENSOR and REMOVE FROM SERVICE.	Water temperature sensor is defective Power supply board is defective.	Replace water temperature sensor. See Section 5-7. Replace power supply board. See Sec 5-16.
T. Unit is operating in the <i>Automatic</i> or <i>Manual</i> mode. The <i>Status</i> display indicates AD BAD and the micro-processor board's alarm sounds.	Defective microprocessor board or a defective power transformer.	Check the secondary voltages from the power transformer. See Figure 6-5B or replace the microprocessor board, see Section 5-17.
U. Unit is operating in the <i>Automatic</i> or <i>Manual</i> mode. The <i>Status</i> display indicates CPU BAD and the micro-processor board's alarm sounds.	Defective microprocessor board.	Replace the microprocessor board. See Section 5-17.
V. Unit is operating in the <i>Automatic</i> or <i>Manual</i> mode. The <i>Status</i> display indicates NRAM BAD and the micro-processor board's alarm sounds.	Defective microprocessor board.	Replace the microprocessor board. See Section 5-17.

5-22. TROUBLESHOOTING GUIDE

OBSERVATION	POSSIBLE PROBLEM	ACTION TO BE TAKEN
W. Unit is set to operate in <i>Automatic</i> or <i>Manual</i> mode; the water flow indicator does not move, i.e.: water not circulating	Operator error; switches not set correctly.	Correctly set switches. See Section 3.
	Disengaged quick disconnect couplings	Check all couplings for proper fit. See Section 2-3.
	Kink in connecting hose and/or blanket	Straighten out the hose.
	Clogged water filter	Clean water filter. See Section 4-3.
	Clogged tubing of blankets	Use forced air to drain blankets. See Sec 4-6.1.
	Clogged couplings	Use forced air to clear couplings.
	Pump not running.	Check for voltage to the pump: a. If line voltage is present: Check and replace pump housing. See Section 5-5.
		Check and replace pump motor. See Section 5-6. b. If line voltage is not present, check and replace 3-pole relays. See Section 5-14. Replace microprocessor board. See Section 5-17.

5-22. TROUBLESHOOTING GUIDE

OBSERVATION	POSSIBLE PROBLEM	ACTION TO BE TAKEN
X. Unit is set to operate in <i>Automatic</i> or <i>Manual</i> mode. Blanket does not cool.	Operator error; switches not set correctly. Water not circulating.	Correctly set switch. See Section 3. See Observation W.
	Compressor running but not cooling. Contact CSZ service.	Check sight glass. Check for leak. Recharge system. See Section 5-19. Check solenoid valve. (Tasks to be done by a qualified refrigeration technician.)
	Compressor not running Contact CSZ service.	Check for voltage to compressor: a. If line voltage is present. b. If line voltage is not present: Check and replace power relay. See Section 5-14. Replace micro-processor board. See Sec. 5-17.

5-22. TROUBLESHOOTING GUIDE

OBSERVATION	POSSIBLE PROBLEM	ACTION TO BE TAKEN
Y. Unit is set to operate in <i>Automatic</i> or <i>Manual</i> mode. Unit status reads cooling but the compressor doesn't run.	Defective 3-pole power relay.	Replace 3-pole power relay. See Section 5-14.
Z. Unit is set to operate in <i>Automatic</i> or <i>Manual</i> mode. Blanket does not heat.	Operator error; switches not set correctly. Water not circulating. Defective heater.	Correctly set switches. See Section 3. See Observation W. Replace heater. See Section 5-3.
AA Unit is set to operate in <i>Automatic</i> or <i>Manual</i> mode. <i>Patient</i> temp display or water temp display not accurate or jumps up and down.	Defective microprocessor board or defective control	Replace microprocessor board. See Section 5-17.
BB Unit is set to operate in <i>Automatic</i> or <i>Manual</i> mode. The unit is cooling when it calls for heating.	Defective 3-pole power relay	Replace 3-pole power relay. See Section 5-14.

SECTION 6. PARTS INFORMATION

6-1. INTRODUCTION

This section outlines information for ordering, shipping and replacing parts of the BLANKETROL II Unit, Model 222. Identification of parts and components are shown in Figures (6-1) and (6-3). The numbers in Figures (6-2) and (6-4) correspond to the numbers in the left column of the accompanying parts list in Figure (6-1) and (6-3). Figures (6-5) to (6-11) diagram the functional operation of the unit and Figure (6-12) lists the BLANKETROL II System equipment and accessories.

6-2. ORDERING INFORMATION FOR REPLACEMENT PARTS

Replacement parts are available directly from CSZ or through our authorized BLANKETROL II dealer. When ordering parts, specify the replacement part number as well as the serial number of your unit located on the identification plate on the rear bumper. There is no minimum order requirement for replacement parts.

Replacement parts from the factory are shipped F.O.B., Cincinnati, Ohio. Generally, parts ordered are shipped within twenty-four hours after receipt of the order. Therefore, it is not necessary to keep a large replacement inventory. However, it may be desirable to stock strategic parts. Section (6-3.) outlines the recommended replacement parts inventory.

It is strongly recommended that all parts be replaced with parts purchased from CSZ or The Surgical Company in Europe. Use of other parts could void the warranty on the unit and possibly damage the unit.

6-3. RECOMMENDED REPLACEMENT PARTS INVENTORY

Part #	Qty.	Description
40253	2	3-Pole Relay
07000	1	1/8" Hansen Socket Fitting
06002	1	1/8" Hansen Plug Fitting
91700	1	Water Level Sensor Assy.
91000	1	3C Pump Housing Assy.
41002	1	Water Temp. Sensor
91125	1	Hi Temp Thermostat
91126	1	Heater - 800W - 115V
91819	1	Heater - 800W - 230V
91708	1	Water Filter Assy.
91200	1	Nylon Strap Assy.

6-4. RETURNING PARTS UNDER WARRANTY

All parts are covered by a two (2) year warranty. To replace parts during the warranty period*, send the part prepaid to:

Cincinnati Sub-Zero Products, Inc.
12011 Mosteller Road
Cincinnati, Ohio 45241
Tel: (513) 772-8810
Fax: (513) 772-9119

To qualify for credit, warranty parts should be tagged with the following information:

1. The invoice number under which the unit/part was purchased
2. Cause of failure
3. Serial Number of Unit
4. Date of installation or purchase
5. RMA number*

* You **must** first obtain a RMA number by calling the factory prior to returning.

6-5. EXCHANGE POLICY FOR ELECTRONIC BOARDS

A replacement microprocessor board, and/or power supply board, and/or control panel can be ordered from the factory. Contact CSZ for details concerning the exchange credit.

6-6. SHIPPING PARTS

Parts to be returned to the factory should be carefully packaged, especially the power supply board, microprocessor board, and control panel. Each of these boards should be cushioned in static safe packaging material to prevent damage from Electro Static Discharge (ESD).

NOTE: **SHIPPING DAMAGE WILL BE THE
RESPONSIBILITY OF THE SHIPPER.
INSURE IF NECESSARY.**

INTERNAL EXPLODED - FRONT VIEW

Index #	I.D. #	Description
1.	52240	Water Fill Opening Lid (Acrylic)
2.	—	Hinge - Black Aluminum
3.	56819	Control Panel
4.	91025	Probe Jack Assembly
6.	40253	3-Pole Relay
7.	09971	Power Supply Board
8.	33515	Relay Socket
9.	39002	Rectifier Bridge
10.	50023	Strain Relief
11.	52503	Manifold Pan
12.	07000	1/8" Socket Hansen Fitting (Female)
13.	06002	1/8" Plug Hansen Fitting (Male)
14.	30302	12 ft. Lead-in Cord with Plug
15.	91810	Water Flow Indicator Assembly
16.	41310	C/F Rocker Switch
17.	91916	Power Switch with Circuit Breaker -15 Amp.-115V/100V
	91915	Power Switch with Circuit Breaker -10 Amp.-230V/240V
18.	51024	Fill Spout Gasket
19.	91700	Water Level Sensor Assembly
20.	09954	Microprocessor Board

FIGURE 6-1. PARTS LIST A

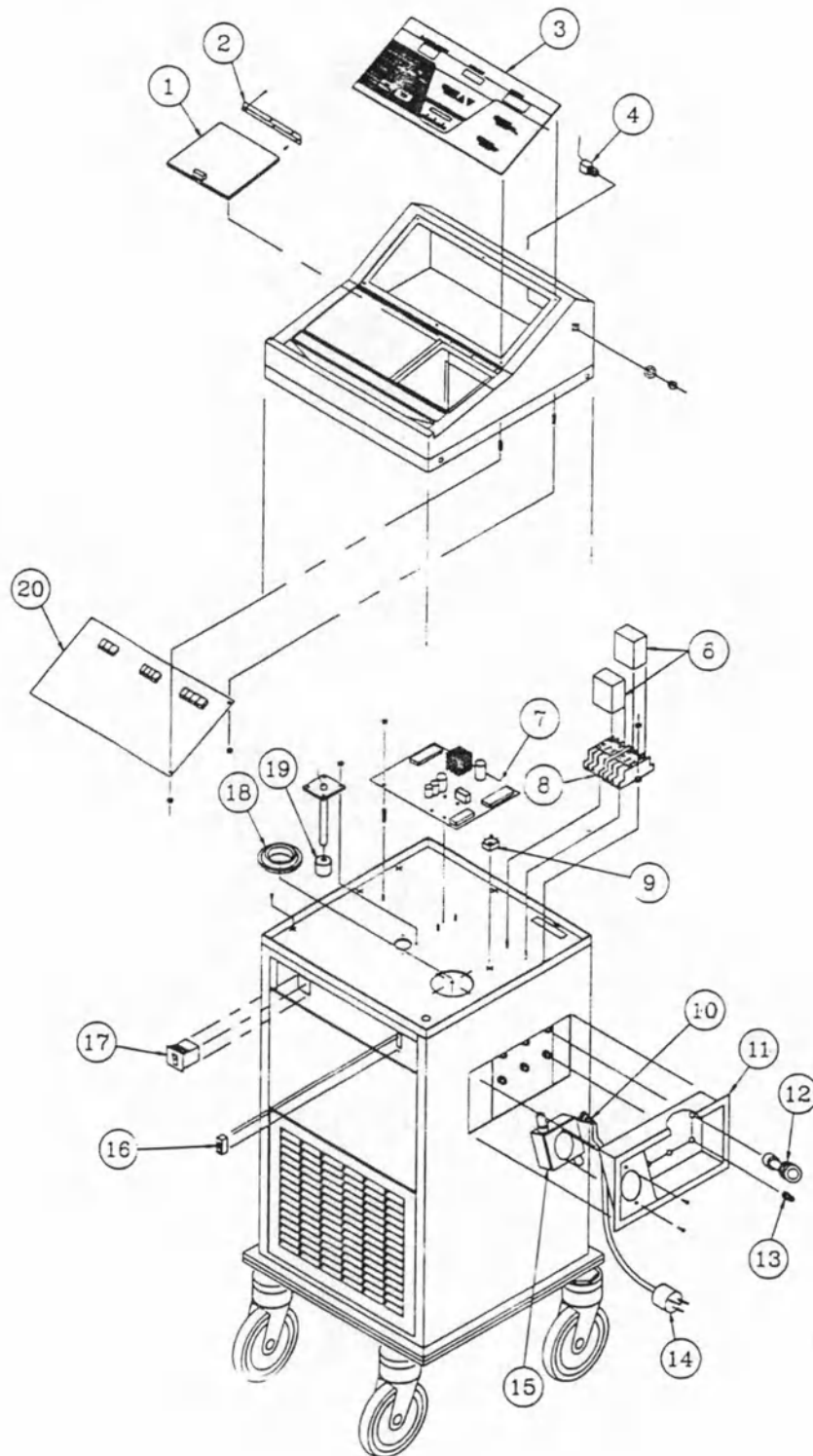


FIGURE 6-2 BLANKETROL II INTERNAL EXPLODED - FRONT VIEW

INTERNAL EXPLODED - REAR VIEW

Index #	I.D. #	Description
1.	51197	Top Assembly
1A.	06508	Top Support Frame
2.	06428	Air Vent
3,4.	60151	Snap Cap and Screw
5.	50149	Overflow Drain Hose Barb
6.	60201	Drawer Stop - 8-32 x 1/2
7.	60401	Shoulder Bolt
8.	60615	Nylon Shoulder Washer
9.	06424	Storage Drawer
10	06425	Grille
11.	45000	Condenser Fan Blade
12.	91059	Condenser Fan Motor - 100V/115V
	91060	Condenser Fan Motor - 230V
13.	04355	Hot Gas By-Pass Valve
14.	00305	Condenser
15.	55023	4" Casters
16.	02008	Drier
17.	05717	Solenoid Valve Body
	91133	Solenoid Valve Coil - 100V/115V
	91132	Solenoid Valve Coil - 230V/240V
18.	03040	Sight Glass
19.	35001	Circuit Breaker - 1 Amp.
20.	06100	Serial Number Plate
21.	00038	115V Compressor Adapter Assembly
	00039	230V Compressor Adapter Assembly
23.	28132	Terminal Block
24.	91611	Transformer - 115V/230V
	91612	Transformer - 100V
25.	91000	3C Pump Housing Assembly
	91123	Complete Pump - 100V/115V
	91124	Complete Pump - 230V
26.	41002	Water Temperature Sensor
27.	03002	Lower Manifold (Outlet)
28.	03003	Upper Manifold (Return)
29.	91200	Nylon Strap Assembly
30	91125	Thermal Disc

FIGURE 6-3. PARTS LIST B

PARTS INFORMATION

BLANKETROL II, 222R
OPERATION/TECHNICAL MANUAL

Index #	I.D. #	Description
31.	91126	Heater - 800W - 100V/115V
	91819	Heater - 800W - 230V
32.**		
33.**		
34.**		
35**		
36,37**		
38.	91619	Evaporator Coil Assy.
39.	51410	Plastic Elbow 3/4" x 3/4"
40.	52016	O-Ring
41.	17024	Capillary Tubing
42.	51421	Reservoir Gasket
43.	53103	Bumper Guard Trim - 68"
**	91708	Complete Water Filter Assembly

NOTE: **ITEM INCLUDED IN #91708

FIGURE 6-3 PARTS LIST B

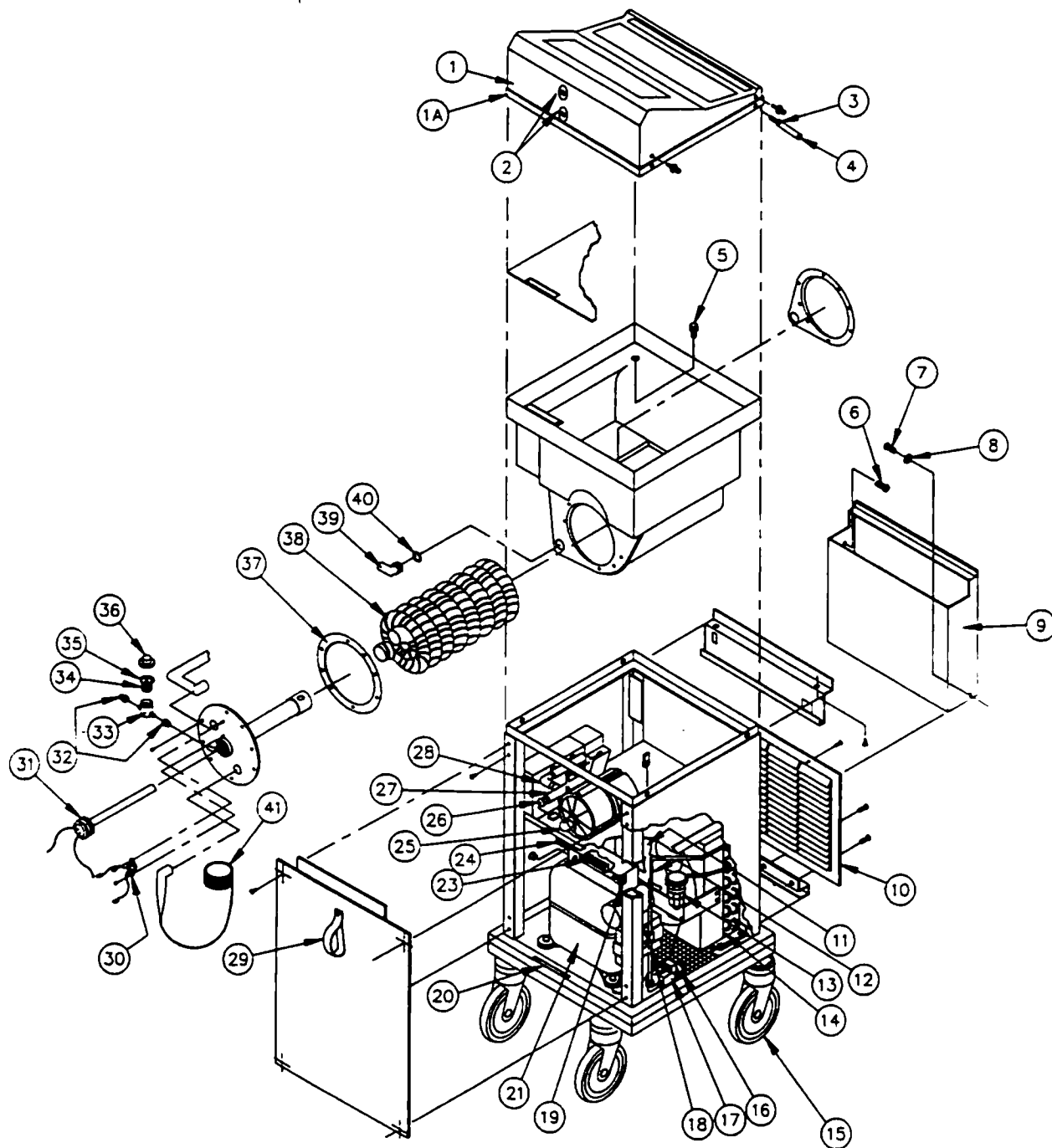


FIGURE (6-4) BLANKETROL II INTERNAL EXPLODED - REAR VIEW

PARTS INFORMATION

BLANKETROL II, 222R OPERATION/TECHNICAL MANUAL

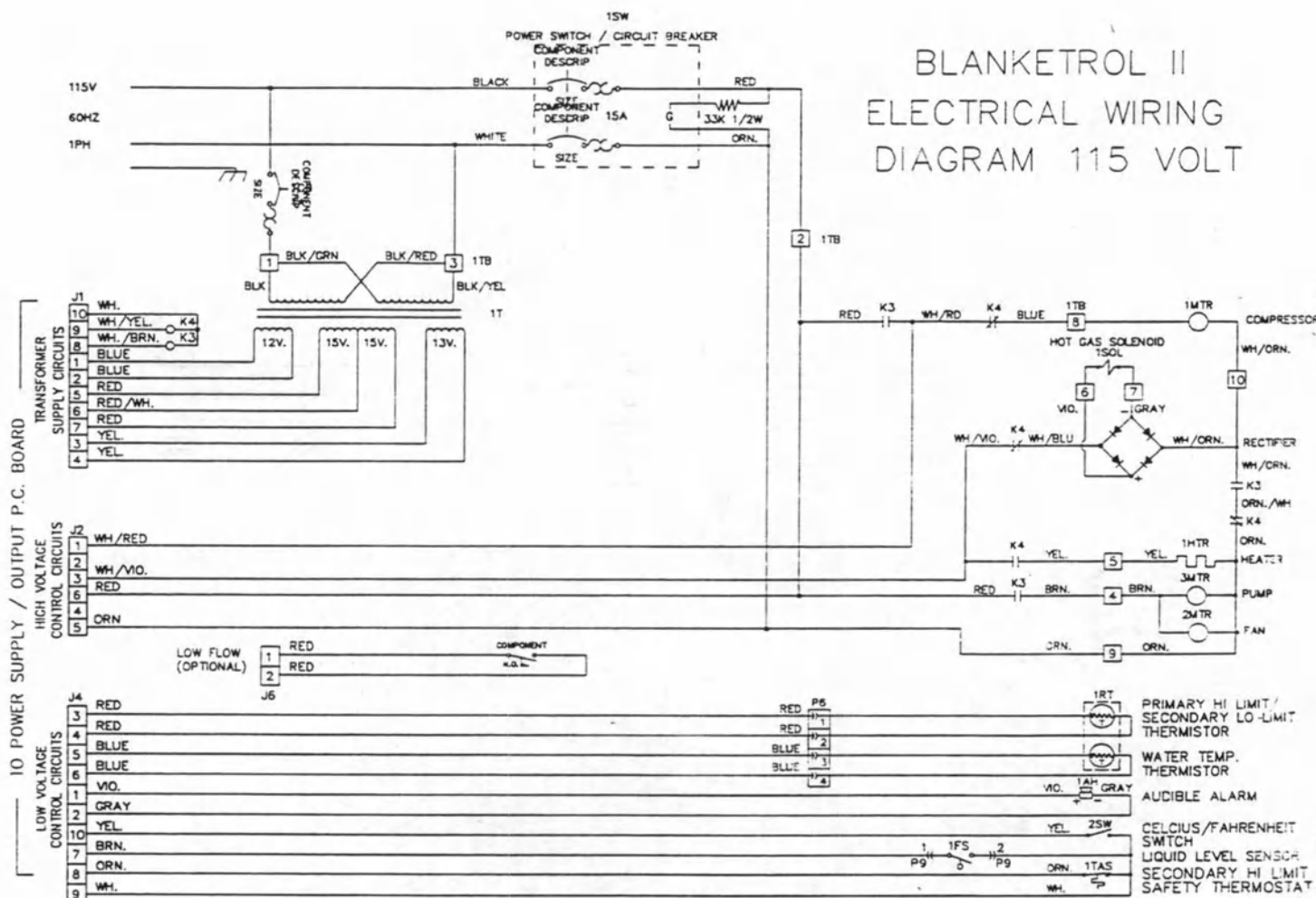


FIGURE 6-5. BLANKETROL II ELECTRICAL WIRING DIAGRAM 115 VOLT

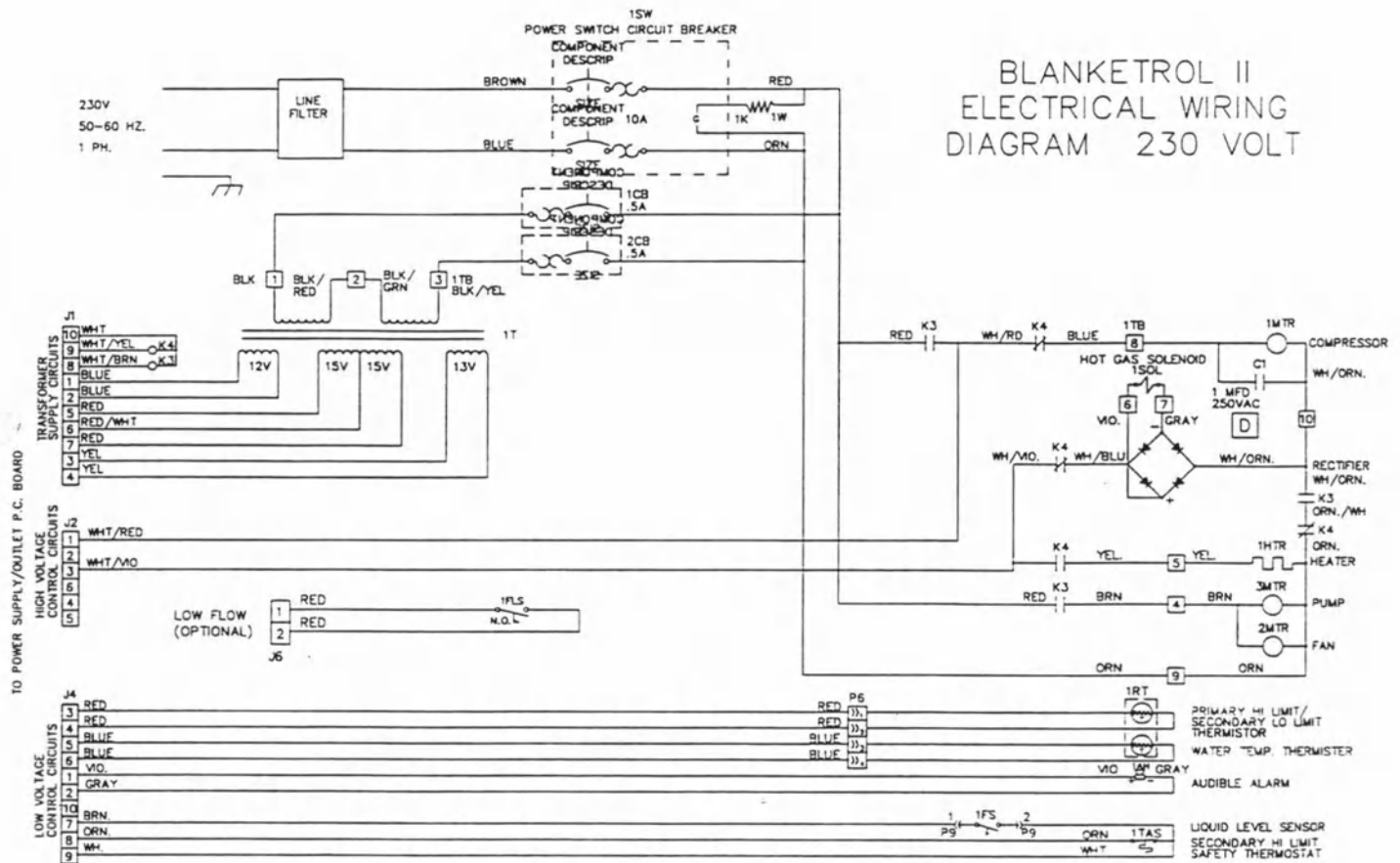


FIGURE 6-5A.
BLANKETROL II ELECTRICAL WIRING DIAGRAM 230 VOLT

PARTS INFORMATION

BLANKETROL II, 222R OPERATION/TECHNICAL MANUAL

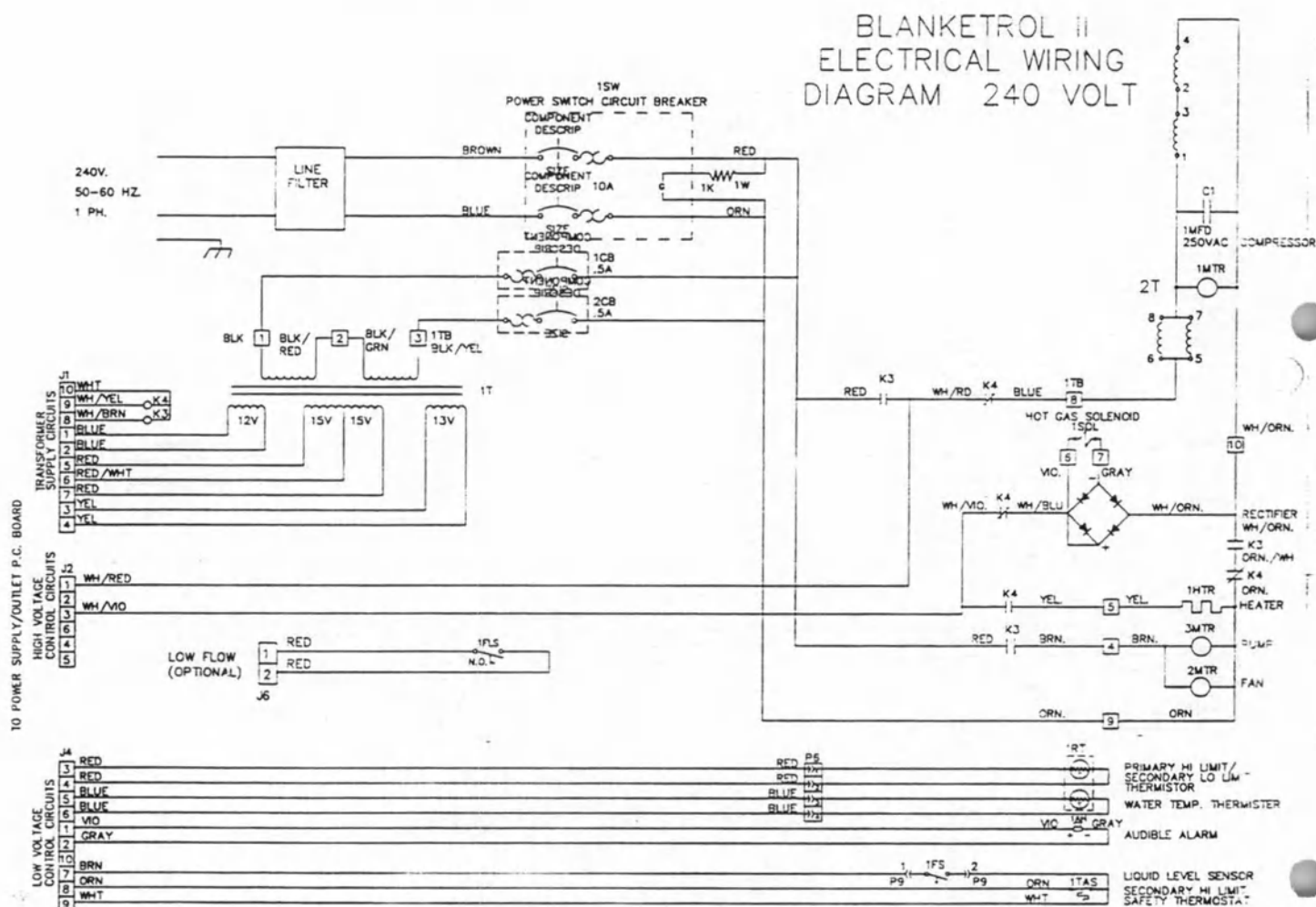


FIGURE 6-5B.
BLANKETROL II ELECTRICAL WIRING DIAGRAM 240 VOLT

PARTS INFORMATION

BLANKETROL II, 222R OPERATION/TECHNICAL MANUAL

BLANKETROL II ELECTRICAL WIRING DIAGRAM 100 VOLT

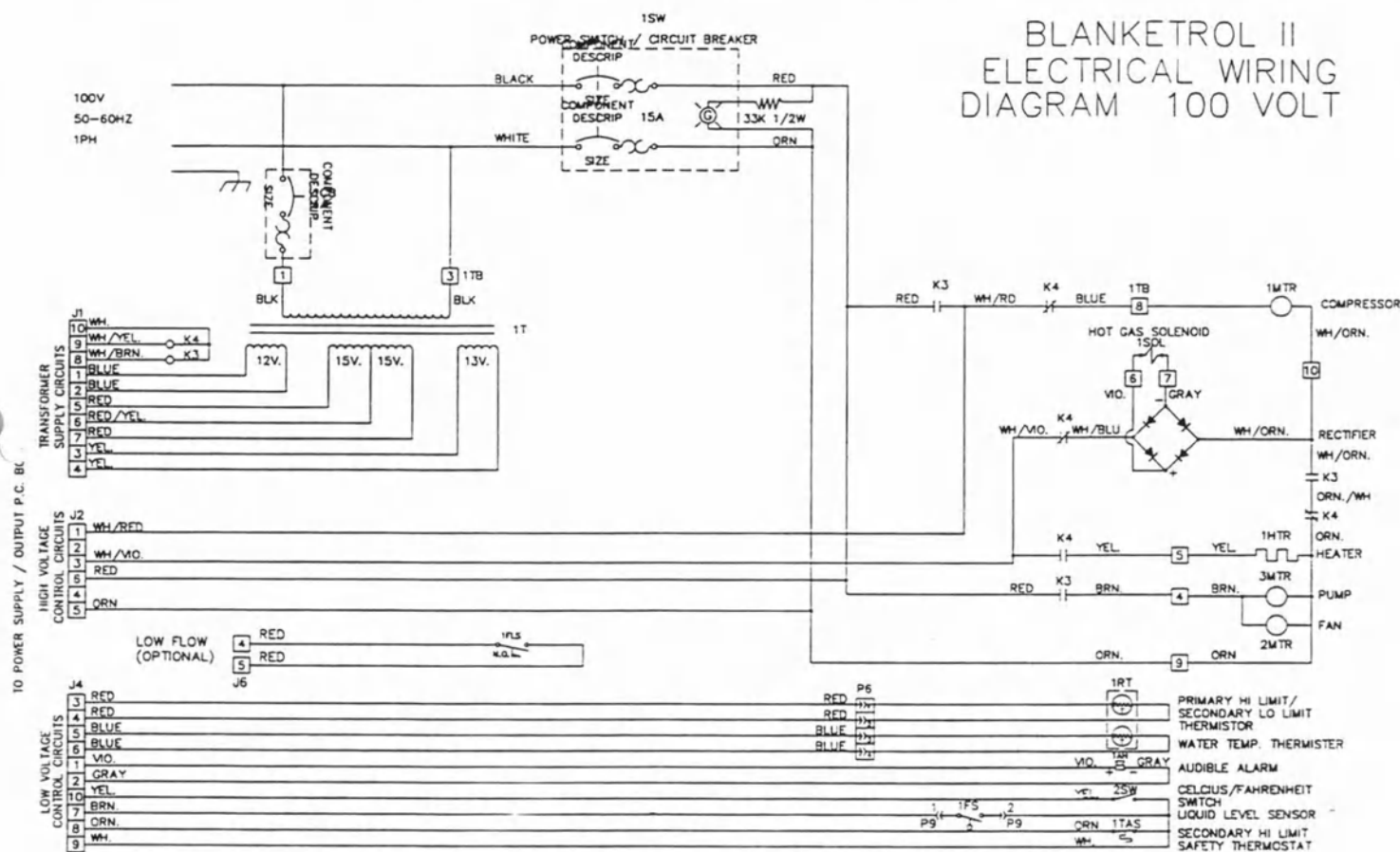


FIGURE 6-5C.
BLANKETROL II ELECTRICAL WIRING DIAGRAM 100 VOLT

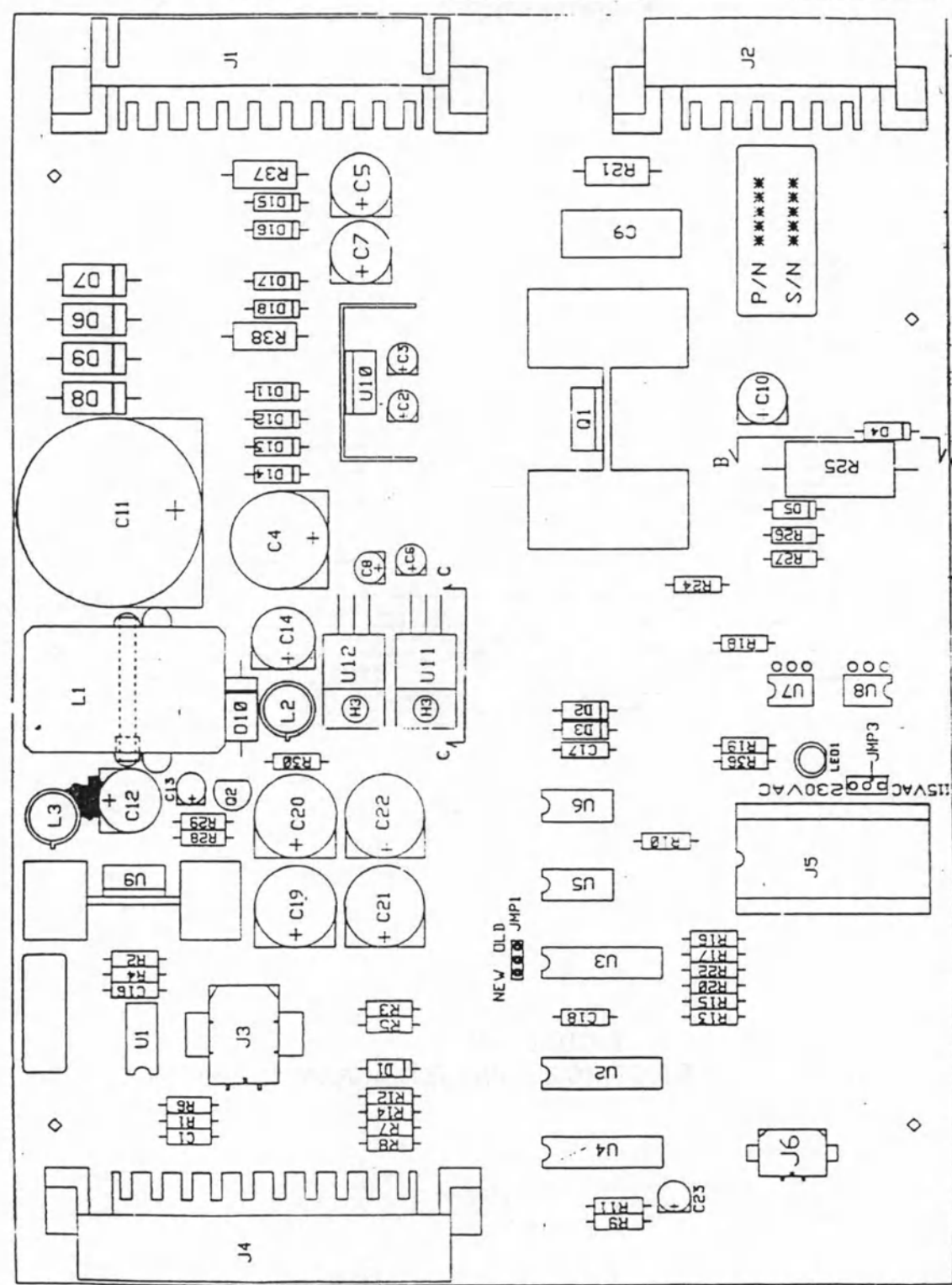


FIGURE 6-6. POWER SUPPLY BOARD - COMPONENT LAYOUT

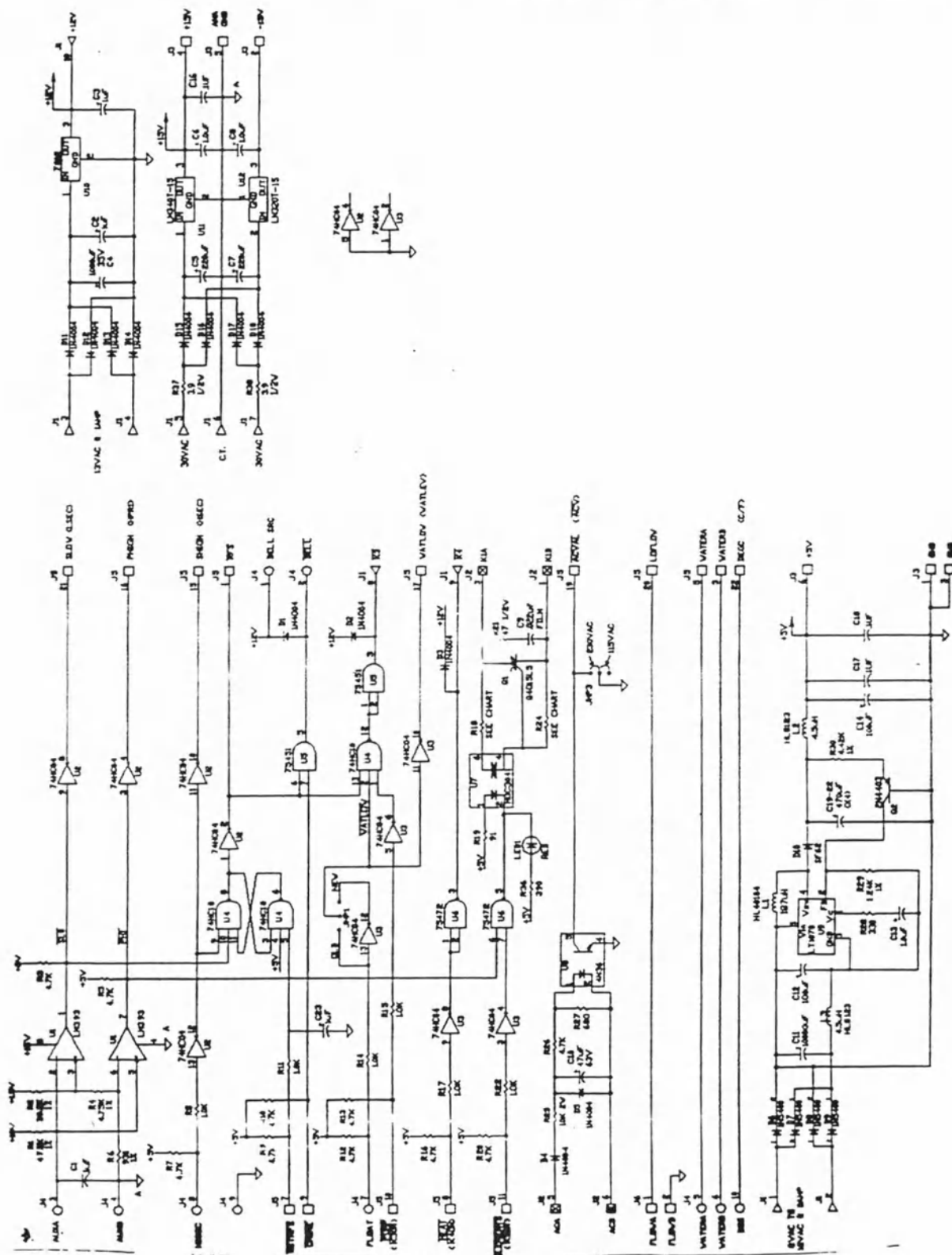


FIGURE 6-7. - POWER SUPPLY BOARD

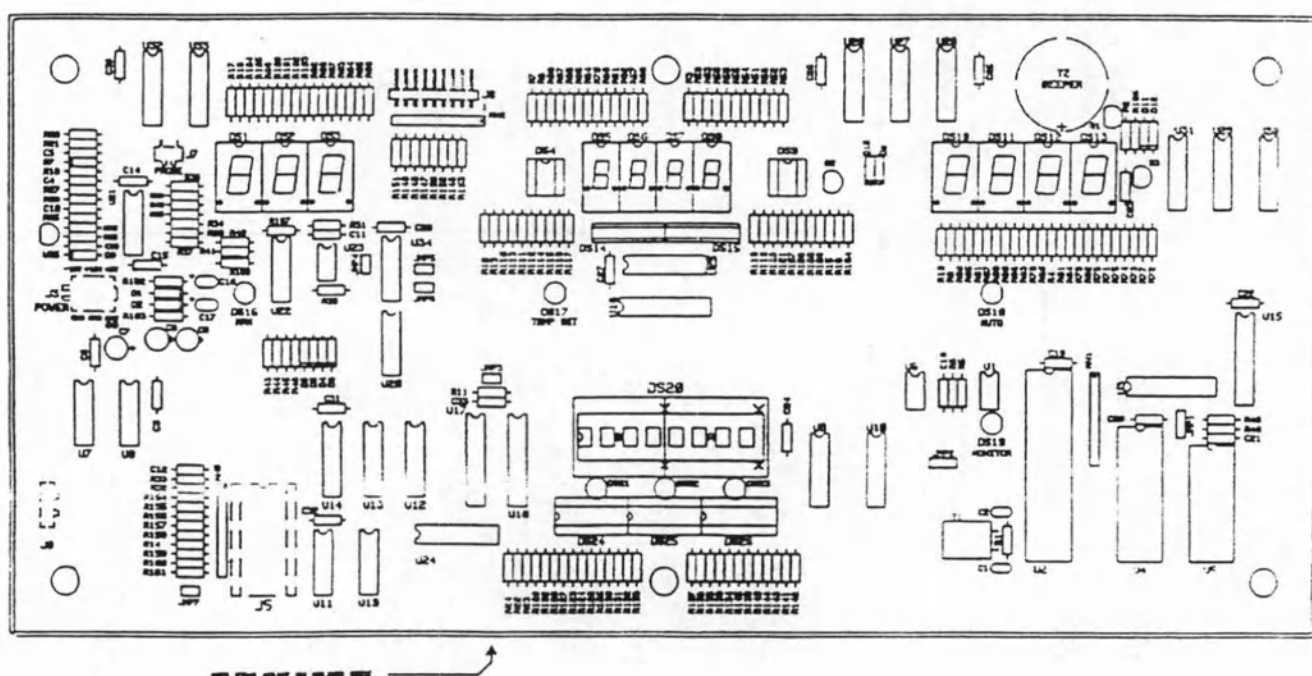
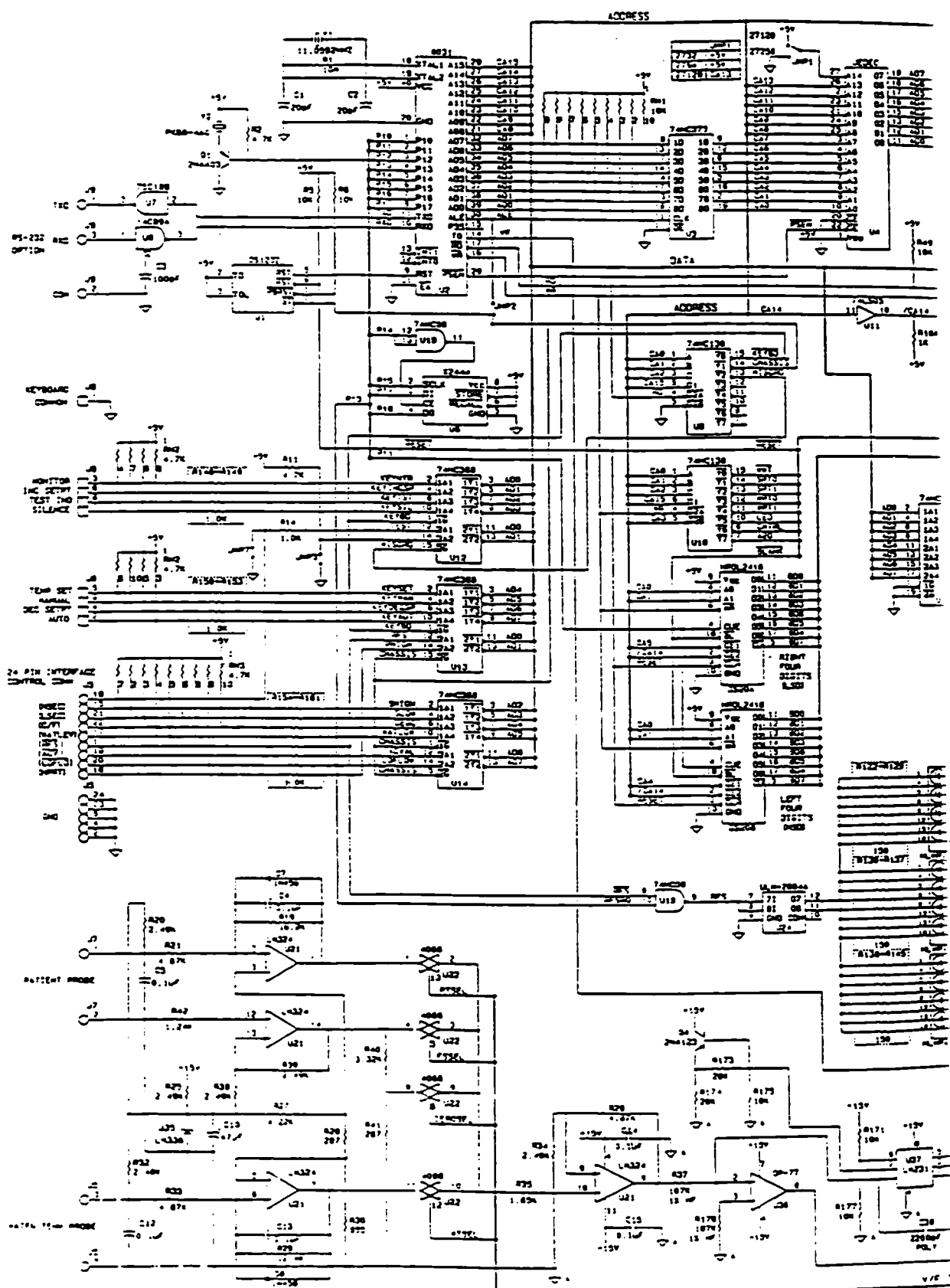
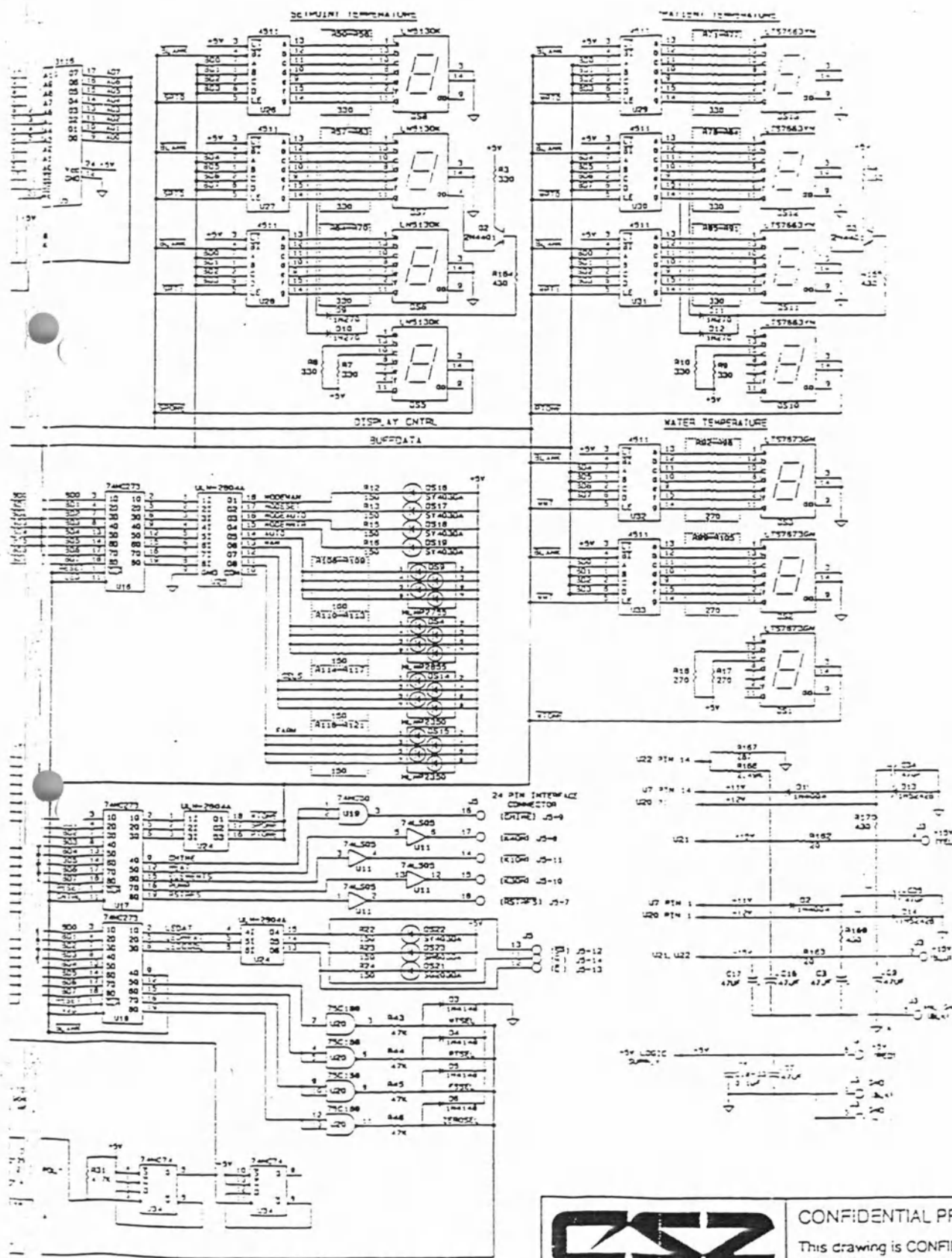


FIGURE 6-8.
MICROPROCESSOR BOARD COMPONENT LAYOUT

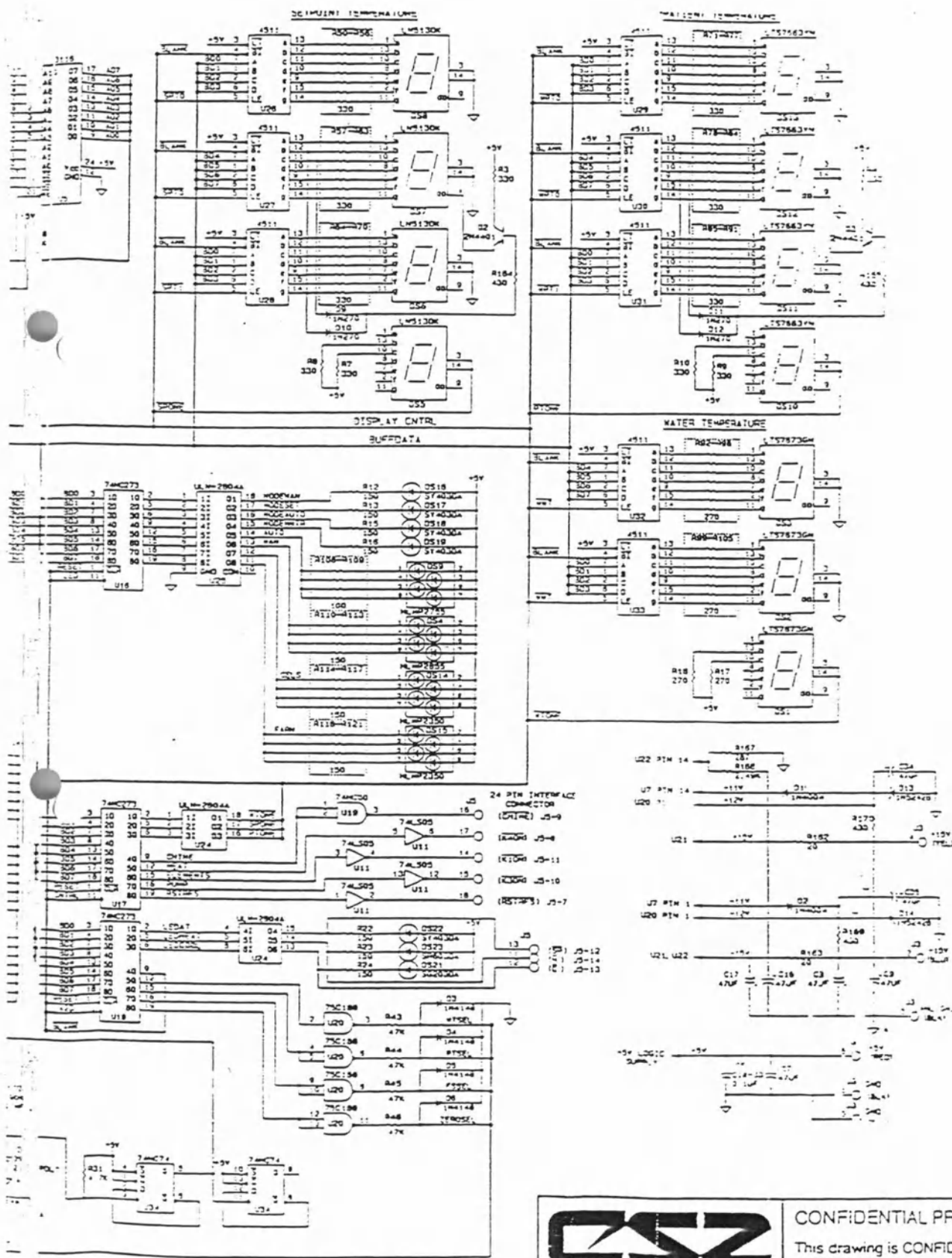




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FIGURE (6-9) - MICROPROCESSOR BOARD



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FIGURE (6-9) - MICROPROCESSOR BOARD

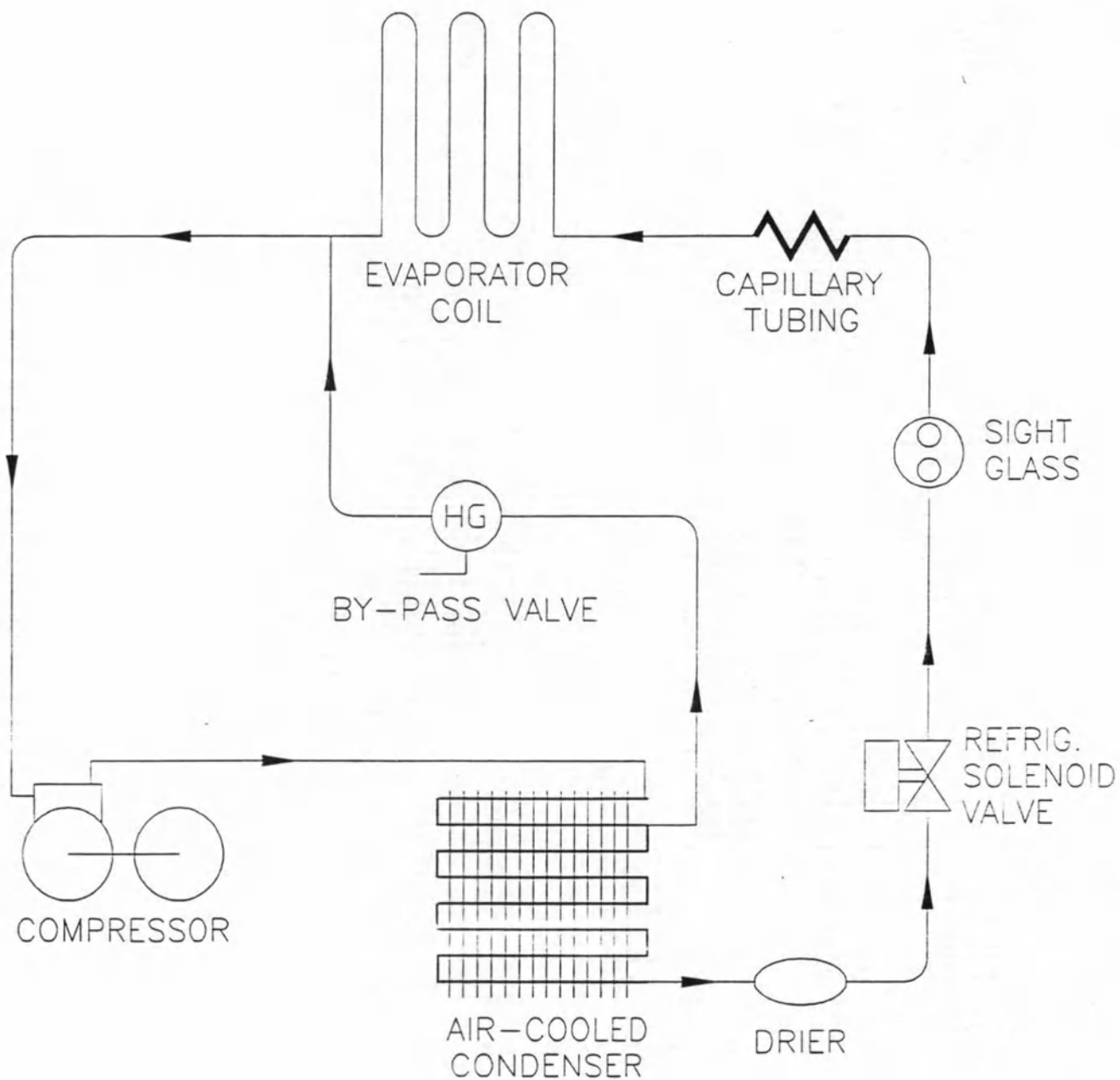


FIGURE 6-11. - BLANKETROL II REFRIGERATION FLOW DIAGRAM

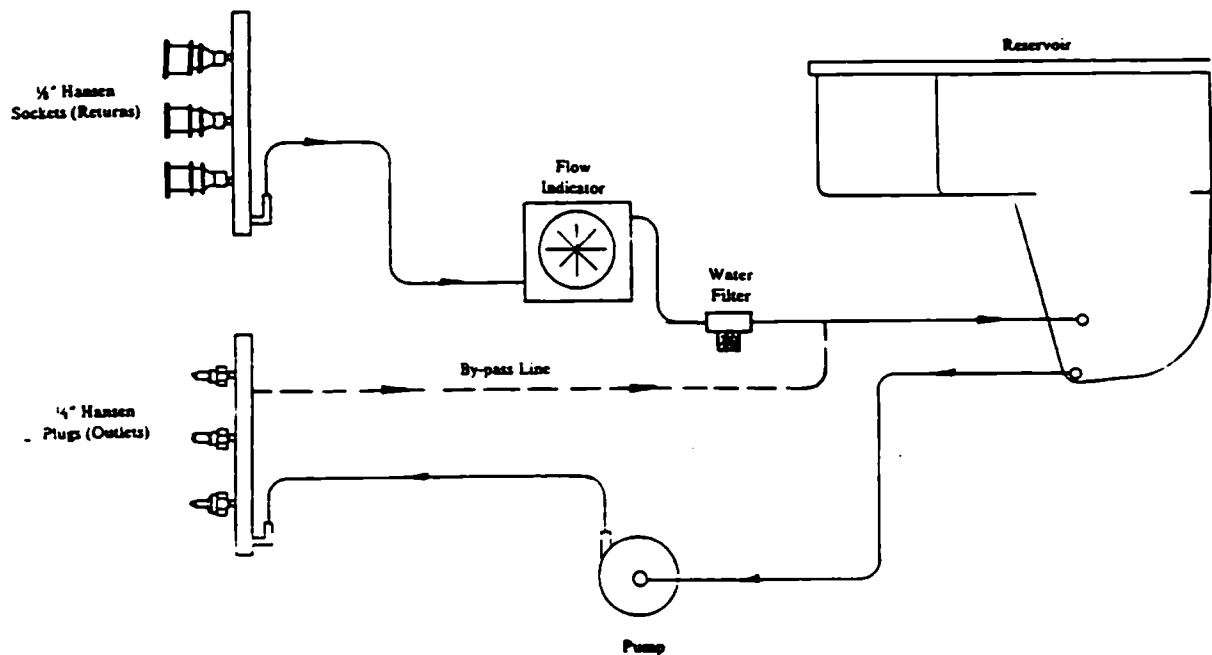


FIGURE 6-10.
BLANKETROL II WATER CIRCULATION DIAGRAM



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