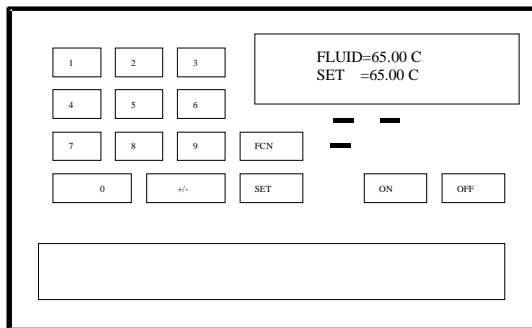


# SERVICE MANUAL FOR DIGITAL AND PROGRAMMABLE MODELS

Information is reserved for trained, qualified technical personnel. It includes schematics & wiring diagrams.  
Any repair or service to a unit is to be performed by a certified technician ONLY.  
Attempting repairs outlined in this guide may result in voiding your warranty

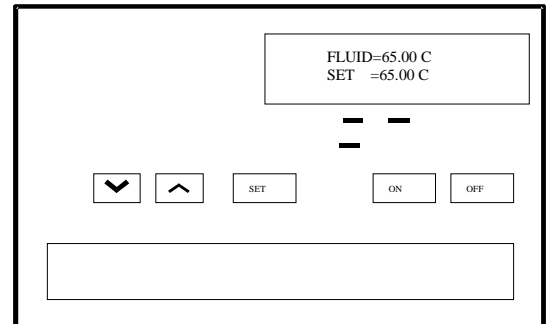


Unplug The Unit Before Servicing



Programmable Models:

7310, 8010, 9010, 9110, 9510, 9610, 9710



Digital Models:

8001, 9001, 9101, 9501, 9601, 9701

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SECTION 1. TROUBLESHOOTING PROCEDURE

**Note: If the unit seems to function normally but fails to control or hold temperature steady, first perform instructions as in "Conditions and Steps before Troubleshooting the Unit"**

**Conditions and Steps before Troubleshooting the Unit**

1. **a.** On units that have a HI/LO pump speed switch on the rear panel, set the pump speed to high and connect the Inlet/Outlet connections with a few feet long length of 1/4" diameter (or greater) hose.  
**b.** On units without the rear HI/LO speed switch, plug the Inlet/Outlet pipes with Nylon 1/4" NPT plugs. If there is a pump speed selection menu, set the pump speed to setting number 1 (highest setting).
2. Use the same fluid and the same setpoint temperature as used in the application.
3. Unit should visibly pump the fluid inside the reservoir. If not, check that the pump shaft spins freely and impeller(s) are in place. If bearings are worn out, replace the entire pump motor.
4. Check that the fluid or fluid mixture is :  
**a.** Watery, not thick like maple syrup. Viscosity <25 centistokes.  
**b.** Not boiling on the surface or freezing to the bottom of the reservoir or cooling coils and not within 5°C of the freezing or boiling point of the liquid.
5. If the Inlet/Outlet connections were used for an external application and the unit operates properly, try the following:  
**a.** Check that externally applied heat does not exceed the rated cooling power of the refrigeration or external heat loss does not exceed the 1000 watts of the heater. Fluids within 40°C of their boiling point can cause so much heat loss as to require more than the 1000 watts of heat provided by the unit, especially in containers with a large open surface area.  
**b.** Cover/uncover and add/remove insulation of both the internal reservoir and external application and tubing. Insulate the top of the fluid with floating plastic or Teflon balls
6. **To return to the factory default setting:**  
 You may easily reset all parameters to factory default settings. With the unit in 'STANDBY" mode, press the UP ARROW key, then the DOWN ARROW key, then the ON key, then select default EEPROM.

PROBLEM	CORRECTIVE ACTION
<p><b>#1</b>  <b>Display does not light up, unit shows no activity</b></p>	<p><b>(a)</b> Check that CONN5 AND CONN6 ribbon connectors are on properly  <b>(b)</b> Check F1 and for line voltage from HOT to NEUTRAL.  <b>(c)</b> Check all supply voltages: +9V,+5V,-9V and -5V.  <b>(d)</b> See section : "<b>Replacing main control board</b>", section 3.</p>

<p><b>#2</b> <b>Breaker trips and unit has an RS232 Port.</b></p>	<p>(a) Connect RS-232 port to a computer. The faulty section will be listed (Ignore RTC message) in the first lines of text when turning unit on</p> <p>(b) Check that display board is properly plugged in.</p> <p>(c) Check if U17 on Main Control Board is missing.</p> <p>(d) See "<b>Replacing main control board</b>", section 3.</p> <p>(e) As a last solution, remove trip coil connections from CB1. If the unit still trips, then check for overcurrent. If not, then check if Q4 is shorted.</p>
<p><b>#3</b> <b>Breaker trips and unit has no RS232 port.</b></p>	<p>(a) Check that display board is properly plugged in.</p> <p>(b) Check if U17 on Main Control Board is missing.</p> <p>(c) See section : "<b>Replacing main control board</b>", section 3.</p> <p>(d) As a last solution, remove trip coil connections from CB1. If the unit still trips, then check for overcurrent. If not, then check if Q4 is shorted.</p>
<p><b>#4</b> <b>Continuously heats with heat light off</b> <b>or</b> <b>Breaker trips and "TRIAC FAILURE PRESS ON SWITCH" message appears</b></p>	<p>(a) Triac Q5 or ISO2 may be shorted. Lift R61 to check. If heat stays on, Triac is shorted. If heat shuts off, pins 4 and 6 of ISO2 should be shorted.</p> <p>(b) Check that Triac Q5 is properly heat-sinked, with heat sink thermal compound grease and screws tightened.</p>
<p><b>#5</b> <b>Intermittent heat with heat light on</b> <b>or</b> <b>Unit not heating and heat light is off</b></p>	<p>(a) Unplug the unit. Check heater resistance for 14.4 ohms for 120V unit or 58 ohms for 240V.</p> <p>(b) Check continuity of heater wires.</p> <p>(c) Check/replace Triac Q5 and then Triac driver ISO2. See Spare Parts, section 5.</p> <p>Check that setpoint is higher than the actual bath temperature. See "<b>Replacing main control board</b>", section 3.</p>
<p><b>#6</b> <b>Unit not pumping</b></p>	<p>Unit should visibly pump the fluid inside the reservoir. If not, check that the pump shaft spins freely and impeller(s) are in place. If bearings are worn out, replace the entire pump motor. See Spare Parts List, section 5.</p>
<p><b>#7</b> <b>Temperature won't reach setpoint temperature.</b></p>	<p>(a) Check heater resistance as in "<b>No heat</b>" #5.</p> <p>(b) Check that there is line voltage at heater.</p> <p>(c) Check for DC on heater. If more than 30 DC volts, replace Triac.</p>
<p><b>#8</b> <b>Unit's temperature rises above setpoint temperature and heat light is on/off.</b></p>	<p>The unit's stirring &amp; pumping motion generates heat. Check unit's specification for ambient temperature and conditions. Try uncovering the bath(s), removing insulation, adding a tap water cooling coil or a refrigeration unit.</p>

<p><b>#9</b> <b>Unit's temperature won't cool down to setpoint temperature.</b></p>	<p>(a) If below 0°C, try lowering the setpoint a few degrees lower than the desired temperature. If it still does not work, see section : "<b>Replacing main control board</b>", section 3.</p> <p>(b) Refrigeration needs servicing.</p> <p>(c) Check for ice build up around tank or refrigeration coils. Use suitable low temperature fluid.</p>										
<p><b>#10</b> <b>Readout not within ±0.25°C of actual temperature.</b></p>	<p>(a) Check that the RTD probe is within ±0.3 ohms of the following table.</p> <table border="1" data-bbox="548 472 1242 535"> <tr> <td>TEMPERATURE:</td> <td>0°C</td> <td>20°C</td> <td>40°C</td> <td>60°C</td> </tr> <tr> <td>PR1 SENSOR OHMS:</td> <td>100.00</td> <td>107.79</td> <td>115.54</td> <td>123.24</td> </tr> </table> <p>(b) If okay, then see: "<b>Replacing main control board</b>", section 3.</p>	TEMPERATURE:	0°C	20°C	40°C	60°C	PR1 SENSOR OHMS:	100.00	107.79	115.54	123.24
TEMPERATURE:	0°C	20°C	40°C	60°C							
PR1 SENSOR OHMS:	100.00	107.79	115.54	123.24							
<p><b>#11</b> <b>Unstable temperature control.</b></p>	<p>(a) See #6 "<b>Unit not Pumping</b>"</p> <p>(b) Refer back to "<b>Conditions &amp; Steps Before Troubleshooting The Unit</b>".</p>										

SECTION 2. REFRIGERATION TEMPERATURES

Ambient temperature should be near 25°C. Unit is in normal operating mode with fluid and set temperature displayed.

**Digital XX01 - To access the head and suction temperatures from the microprocessor:**

1. Press and hold the Set/Enter button until display reads "CONTRAST ADJUST PRESS UP or DOWN".
2. Press and hold the Set/Enter button until display changes to display the temperature of the sensors.
3. The lower left temperature is the Head Sensor. The lower middle temperature is the Suction sensor. Disregard the ohms and voltage to avoid confusion.
4. The Head sensor should read between +20°C and +100°C varying with operation. A reading of -51°C or +150°C and higher is a defective sensor.
5. The Suction sensor should read between +20°C and -20°C varying with operation. A reading of -51°C or +150°C and higher is a defective sensor.

**Programmable XX10 - To access the head and suction temperatures from the microprocessor:**

1. Press the Function and Contrast buttons. The display reads "CONTRAST ADJUST PRESS UP or DOWN".
2. Re press and HOLD Set/Enter button until display changes to read the temperature of sensors.
3. The lower left temperature is the Head Sensor. The lower middle temperature is the Suction sensor. Disregard the ohms and voltage to avoid confusion.
4. The Head sensor should read between +20°C and +100°C varying with operation. A reading of -51°C or +150°C and higher is a defective sensor.
5. The Suction sensor should read between +20°C and -20°C varying with operation. A reading of -51°C or +150°C and higher is a defective sensor.

Example head and suction pressures and temperatures.

**Full cooling power operation when fluid is above 0°C**

Set the set point temperature down to -10°C or below

Refrigerant	Head PSI	Head Temp.	Suction PSI	Suction Temp.
Freon R12	175	100°C	20	> 0°C
SUVA MP39	190	100°C	18	> 0°C
SUVA R134A	193	100°C	18	> 0°C

**When controlling at a stabilized setpoint temperature above 0°C**

Refrigerant	Head PSI	Head Temp.	Suction PSI	Suction Temp.
Freon R12	90 to 110	40°C to 60°C	-20 to -10	15°C to 35°C
SUVA MP39	92 to 112	40°C to 60°C	-20 to -10	15°C to 35°C
SUVA R134A	92 to 112	40°C to 60°C	-20 to -10	15°C to 35°C

**When fluid temperature is below 0°C**

Refrigerant	Head PSI	Head Temp.	Suction PSI	Suction Temp.
Freon R12	95 to 115	40°C to 60°C	< -10	-15°C to -10°C
SUVA MP39	97 to 117	40°C to 60°C	< -10	-15°C to -10°C
SUVA R134A	97 to 117	40°C to 60°C	< -10	-15°C to -10°C

Note: It is normal to hear a quiet click once every five seconds while the compressor runs. This is the modulating valve turning on & off.

**Quick Valve Seat Check**

With a refrigeration pressure gauge attached to the suction line an easy check can be done to check the modulation valve and compressor valve seats for a good seal.

1. The two black wires to the modulating valve go to CONN145. Remove this connector from the modulating PC board.
2. Run the refrigeration for about 30 seconds. The suction should drop below -20PSI.
3. Shut off the unit. The pressure should not change for at least a minute.
4. Replace CONN14 when finished.

**SECTION 3. REPLACING MAIN CONTROL BOARD.**

When removing/replacing the main control board, always remove/replace the bath temperature probe(s) included with the board. Temperature probes are calibrated to each board at the factory.

Do not lose the nylon washer between the board mounting bracket and the main board where the nut fastens. This prevents a possible short circuit to the power supply board.

**SECTION 4. DIGITAL/PROGRAMMABLE FIELD TEMPERATURE CALIBRATIONS INSTRUCTIONS**

**We recommend sending the Main Control Board, Internal Temperature Probe and External Temperature Probe (if supplied) back to the factory.**

**You will require the following items**

1. Computer with RS232 interface, RS232 serial cable.
2. A communications program. We recommend the use of Procomm®.
3. Run communications software at: 9600 baud, 1 Start Bit, 8 Data Bits, 1 Stop Bit and No Parity Bit.
4. Two baths, one at zero Celsius (0°C) and one at a high temperature (100°C-200°C) or at the user's most commonly used temperature. You must calibrate both calibration points together. HIGH and LOW calibration points cannot be entered separately.
5. NIST traceable standard thermometer(s). Ranging from 0°C to a temperature between 100°C - 200°C.

**For units without RS 232 interface socket**

Refer to schematic RS232 on page 14 for installation.

**For units with RS 232 socket**

If you are calibrating the internal probe, remove the probe from the bath and make sure that it will reach both calibration baths. Run a serial communications program as described above. The commands used below are in between quotation marks and must be in upper case letters.

**1. a. UNITS WITH FULL NUMERIC KEYPAD (Programmable models, xx10):**

Remove refrigeration and heating power connections if desired.

Turn on unit and press FCN 8 on keypad.

Type "A1<return>" to see echoed characters from the keyboard.

Type "\$C<return>" and a menu will appear on the computer screen.

**b. UNITS WITH SIMPLE KEYPAD (Digital models, xx01):**

While turning on, Hold ON Button Down until "SERIAL LINK COMMUNICATION" appears on the display and a menu appears on the computer screen.

Select "A" from the menu and another menu will appear.

2. Type "C" for internal probe.
3. Place probe into the bath near zero Celsius (0°C) and type "L". Let probe settle to temperature and then type in the exact temperature and "<return>".
4. Place probe into a bath at a high temperature, 100°C to 200°C and type "H". Let probe settle to temperature and then type in the exact temperature and "<return>".
5. Type "C". Numbers displayed should now be correct. Place probe back in the low temperature bath to double check the reading.
6. When correct, type "X". The unit will tell you to wait while it stores the new calibration points.

**ON MODELS WITH EXTERNAL PROBE**

If the model has an external probe and is in need of calibration, repeat steps 2 through 6 and substitute "D" for "C" in Step 2.

If you enter the calibration menu and you are not ready to calibrate the unit, just type "X". The unit will print the wait message just as in Step 6, but only store the current values.

**SECTION 5. SPARE PARTS LIST**

REF#	DESCRIPTION	PART#
CAP1	CAPACITOR, MOTOR RUN, 370VAC, 6uF, 120V	205-056
CAP1	CAPACITOR, MOTOR RUN, 440VAC, 3uF, 208-240V	205-060
CB1	TRIP CIRCUIT BREAKER WITH TRIP COIL, 12 AMP, 120V	215-039
CB1	TRIP CIRCUIT BREAKER WITH TRIP COIL, 6 AMP, 240V	215-040
DSP1	DISPLAY BOARD, TESTED	500-076
H1	HEATER, TUBULAR 5" DIA. COIL, 1KW, 120V	215-119
H1	HEATER, TUBULAR 5" DIA. COIL, 1KW, 240V	215-120
J1	LINE CORD, 120V, 6 FT, 16GA, WITH PLUG FOR USA/CANADA	225-010
J1	LINE CORD, 120V, 8 FT, 14GA, WITH PLUG FOR USA/CANADA	225-159
J1	LINE CORD, 240V, WITH PLUG FOR EUROPE	225-112
J1	LINE CORD, 240V, WITH PLUG FOR AUSTRALIA	225-115
J1	LINE CORD, 240V, WITH PLUG FOR GREAT BRITAIN (UK)	225-116

PR1	PROBE, RTD, 100 OHMS @ 0C, 4-WIRE	200-136
S1	SWITCH, PUMP SPEED	235-008
S2	SAFETY THERMOSTAT, OTP	215-122
PCB1	PC BOARD, POWER, 120V, TESTED	500-077
PCB1	PC BOARD, POWER, 240V, TESTED	500-085
MTR1	PUMP MOTOR, FOR MODELS XX01, 120V	215-235
MTR1	PUMP MOTOR, FOR MODELS XX01, 240V	215-236
PCB2	PC BOARD, MAIN CONTROL, CALIBRATED MODELS XX01	500-075
PCB2	PC BOARD, MAIN CONTROL, CALIBRATED MODELS XX10	500-079
MTR2	PUMP MOTOR, FOR MODELS XX10 and 9501,9601 120V	215-113
MTR2	PUMP MOTOR, FOR MODELS XX10 and 9501,9601 240V	215-114
-	DECKLID ASSEMBLY <b>(1) (2) (3)*</b>	510-035
-	COMPLETE REFRIGERATION ASSY, TESTED 120V <b>(2)*</b>	575-050
-	COMPLETE REFRIGERATION ASSY, TESTED 240V <b>(2)*</b>	575-051
	MOTOR MOUNTING KIT(ORDER WHEN REPLACING MOTOR) FOR MODELS 8001, 9001, 9101	510-020
-	COMPRESSOR 1/6 HP, USA MODELS BEFORE SN/926062, 240V, 50HZ <b>(2) (3)*</b>	750-017
-	COMPRESSOR 1/4 HP, EUR MODELS AFTER SN/926061, 240V, 50HZ <b>(2) (3)*</b>	750-022
-	COMPRESSOR FAN AXIAL 4" 120V <b>(2) (3)*</b>	215-196
-	COMPRESSOR FAN AXIAL 4" 240V <b>(2) (3)*</b>	215-197
-	COMPLETE REFRIGERATION ASSY, TESTED 120V <b>(3)*</b>	575-142
-	COMPLETE REFRIGERATION ASSY, TESTED 240V <b>(3)*</b>	575-143
-	COMPLETE REFRIGERATION ASSY, TESTED 120V <b>(4)*</b>	575-054
-	COMPLETE REFRIGERATION ASSY, TESTED 240V <b>(4)*</b>	575-055
-	DECKLID ASSEMBLY <b>(4)*</b>	510-004
-	COMPRESSOR FAN AXIAL 10" 120V <b>(4) (5)*</b>	750-006
-	COMPRESSOR FAN AXIAL 10" 240V <b>(4) (5)*</b>	750-021
L1	MODULATING VALVE <b>(4) (5)*</b>	750-093
-	COMPRESSOR 1/3 HP, USA, 120V, 60HZ <b>(4) (5)*</b>	750-109
-	COMPRESSOR 1/2 HP, EUR, 240V, 50HZ <b>(4) (5)*</b>	750-023
PCB4	PC BOARD, MODULATING VALVE COMPRESSOR, 120V <b>(4) (5)*</b>	500-078
PCB4	PC BOARD, MODULATING VALVE COMPRESSOR, 240V <b>(4) (5)*</b>	500-086
-	COMPLETE REFRIGERATION ASSY, TESTED 120V <b>(5)*</b>	575-056
-	COMPLETE REFRIGERATION ASSY, TESTED 240V <b>(5)*</b>	575-057
-	DECKLID ASSEMBLY <b>(5)*</b>	510-054
-	TEMP. ADJUST KNOB	330-039

\* **(1)** FOR MODELS 8001, 8010 ONLY  
**(2)** FOR MODELS 9001, 9010 ONLY

**(3)** FOR MODELS 9101, 9110 ONLY  
**(4)** FOR MODELS 9501, 9510 ONLY  
**(5)** FOR MODELS 9601, 9610 ONLY

XX01: Digital Controller Models  
XX10: Programmable Controller Models

**PC BOARD COMPONENTS**

REF#	DESCRIPTION	PART#
T1	XFORMER,120/240V, POWER SUPPLY	215-115
T2	XFORMER, 120/240V, MODULATING BOARD	215-116
ISO1/3/6	OPTOISOLATOR/TRIAC DRIVER	200-089
ISO4/5	OPTOISOLATOR/CURRENT SENSOR	200-110
Q4	ALTERNISTOR, Q401E3	200-076
Q5,Q6,Q7	ALTERNISTOR, Q4015L9	200-109

**MAIN CONTROL BOARD 500-075 OR 500-079**

REF#	DESCRIPTION	PART#
C1/17/43/46	CAPACITOR, TANT, 10uF, 10V	-
C2/3/5/6/7/8/16/18/19/27/29/32/33/36/37/38/39/41/42/44/51	CAPACITOR, CERAMIC MONOLITHIC, 0.1uF, 50V	-
C9,10,11,12	CAPACITOR, TANT, 1uF, 35V	-
C14, C15	CAPACITOR, CERAMIC MONOLITHIC, 18pF, 100V	-
C26	CAPACITOR, LYTIC, 330uF, 16V	-
C28, C45	CAPACITOR, CERAMIC MONOLITHIC, 0.33uF, 50V	-
C34, C40	CAPACITOR, TANT, 4.7uF, 10V	-
C35	CAPACITOR, CERAMIC MONOLITHIC, 0.047uF	-
R1,R78,R79	RES, 100K, 5%, 1/4W	-
R4	RES, 2K, 1%, 1/4W	-
R5	RES, 499 OHMS, 1%, 1/4W	-
R6	RES, 475, 1%, 1/4W	-
R7	RES, 80.6K, 1%, 1/4W	-
R8,R17	RES, 10K, 1%, 1/4W	-
R28	RES, 10K, 5%, 1/4W	-
R30/31/32,33/45/46/47/49	RES, 100K, 0.5%, 1/4W	-
R18	RES, 51.1K, 1%, 1/4W	-
R20,R21	RES, 2.7K, 5%, 1/4W	-
R29	RES, ZERO OHM	-
R34,R48	RES, 500 OHM, 0.1%, 1/4W	-
R35,R43	RES, 10K,1%, 1/4W	-
R36,R44	RES, 1.3K,1%, 1/4W	-
R37,R42	RES, 4.7K,1%, 1/4W	-
R38	RES, 200 OHM, 1%, 1/4W	-
R39,R41,R53	RES, 10 OHM, 1%, 1/4W	-
R40	RES, 4.7K, 5%, 1/4W	-
R84,R85	RES, 1K, 5%, 1/4W	-
Q8	TRANSISTOR, PNP 2N3906	-



SPEAK1	SPEAKER, PIEZOELECTRIC, MINIATURE	200-114
U1	IC, MICROPROCESSOR HD63A03XP	200-115
U2	IC, EPROM, (GIVE VERSION CODE WRITTEN ON CHIP)	200-116
U3	IC, RAM,STATIC 43256	200-117
U4	IC, TRANSCEIVER 74HC245N	200-118
U5	IC,PEEL 18CV8-35	200-119
U7	IC,+5V VOLTAGE REGULATOR LM2940CT	200-120
U8	IC,DRIVER ARRAY ULN2003L	200-121
U9	IC,RS232 DRIVER MAX233CPA	200-122
U10	IC,WATCHDOG MAX690	200-123
U12	IC,QUAD ANALOG SWITCH DG211	200-133
U13,U19,U21	IC,OP AMP,DUAL AD706JN	200-125
U14	IC,A/D-D/A CONVERTER PCF8591PN	200-127
U15	IC,VOLTAGE REFERENCE,2.5V LM336Z-2.5	200-128
U17	IC,EEPROM X24C02P	200-129
U18	IC,D-FLIP-FLOP,OCTAL,3-STATE 74HC574	200-130
U20	IC,A/D CONVERTER,16 BIT C5501	200-131
U22	IC,VOLTAGE REGULATOR,-5V,79L05A OR LM320LZ-5	200-132
Y1	CRYSTAL,4.915 MHZ	200-113

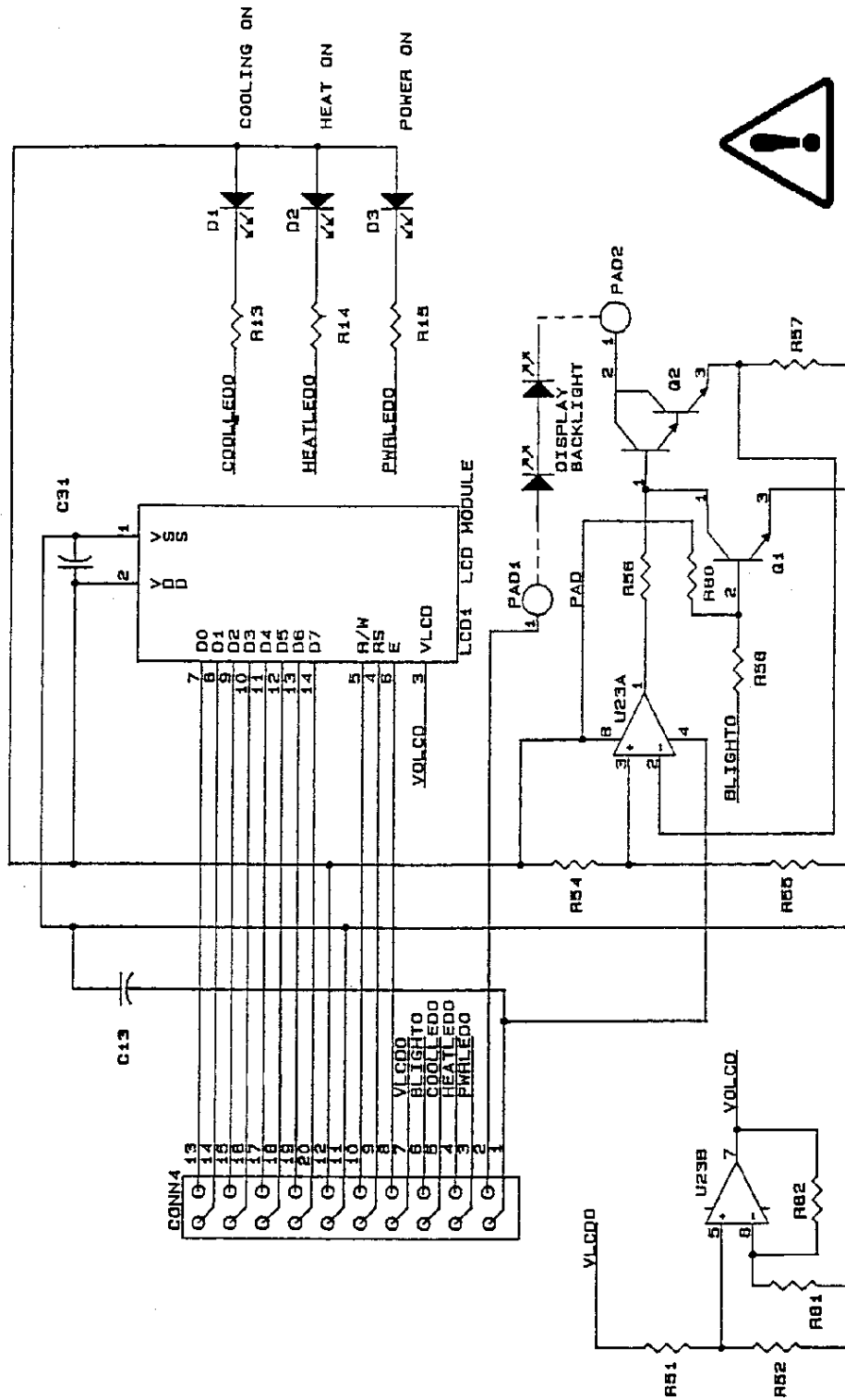
**DISPLAY BOARD 500-076**

REF#	DESCRIPTION
C13,C31	CAPACITOR, CERAMIC MONOLITHIC, 0.1uF,50V
D1	LED,SQUARE,GREEN
D2,D3	LED,SQUARE,RED
Q1	TRANSISTOR,NPN 2N3904
Q2	TRANSISTOR,NPN,DARLINGTON TIP 110
R13,R14,R15	RES, 150 OHMS, 5%, 1/4W
R51,R52,R81	RES, 10K, 1%, 1/4W
R54	RES, 9.09K, 1%, 1/4W
R55	RES, 1K, 5%, 1/4W
R57	RES, 2.21 OHMS, 1%, 1/4W
R58	RES, 4.7K, 5%, 1/4W
R80	RES, 47K, 5%, 1/4W
R82	RES, 10K, 1%, 1/4W

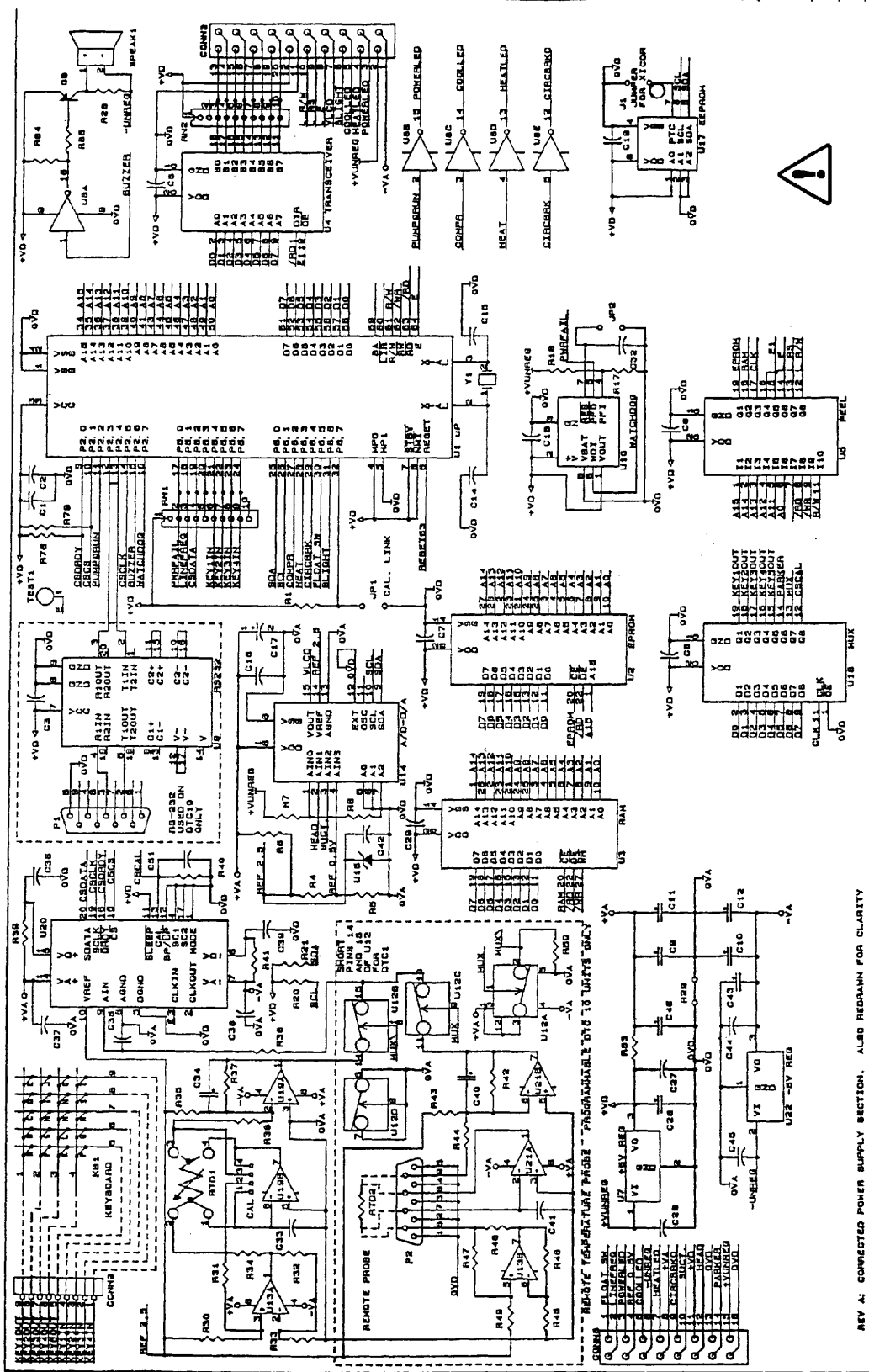
**POWER SUPPLY 500-077 OR 500-085**

REF#	DESCRIPTION
BR1,2	BRIDGE, RECTIFIER, 1.5A
C1	CAPACITOR, LYTIC, 1000 MFD, 50V
C47	CAPACITOR, LYTIC, 2200 MFD, 16V
C48	CAPACITOR, LYTIC, 330 MFD, 16V
C50	CAPACITOR, LYTIC, 0.1 MFD, 400V (0.47uF FOR 240V)
D1,D6	DIODE, 1N4005
F1	FUSE, 2AG, 250V, 1/4(.25) AMPERE
Q3	TRANSISTOR, HEXFET, IRFZ 12-ND
R1,R11,R12	RESISTOR, 100K, 1/4W, 5%
R59,R61,R63,R75	RESISTOR, 51 OHM, 1/4W,5%
R60,R62,R64,R76	RESISTOR, 270 OHM, 1/4W,1%
R65,R70	RESISTOR, 10K, 1/4W, 5%
R66,R67,R68,R69, R71,R72,R73,R74	RESISTOR, 33.2K, 1/4W, 1%, 120V
R66,R67,R68,R69, R71,R72,R73,R74	RESISTOR, 100K, 1/4W, 5%, 240V
R83	RESISTOR, 100 OHMS, 1/4W, 5%

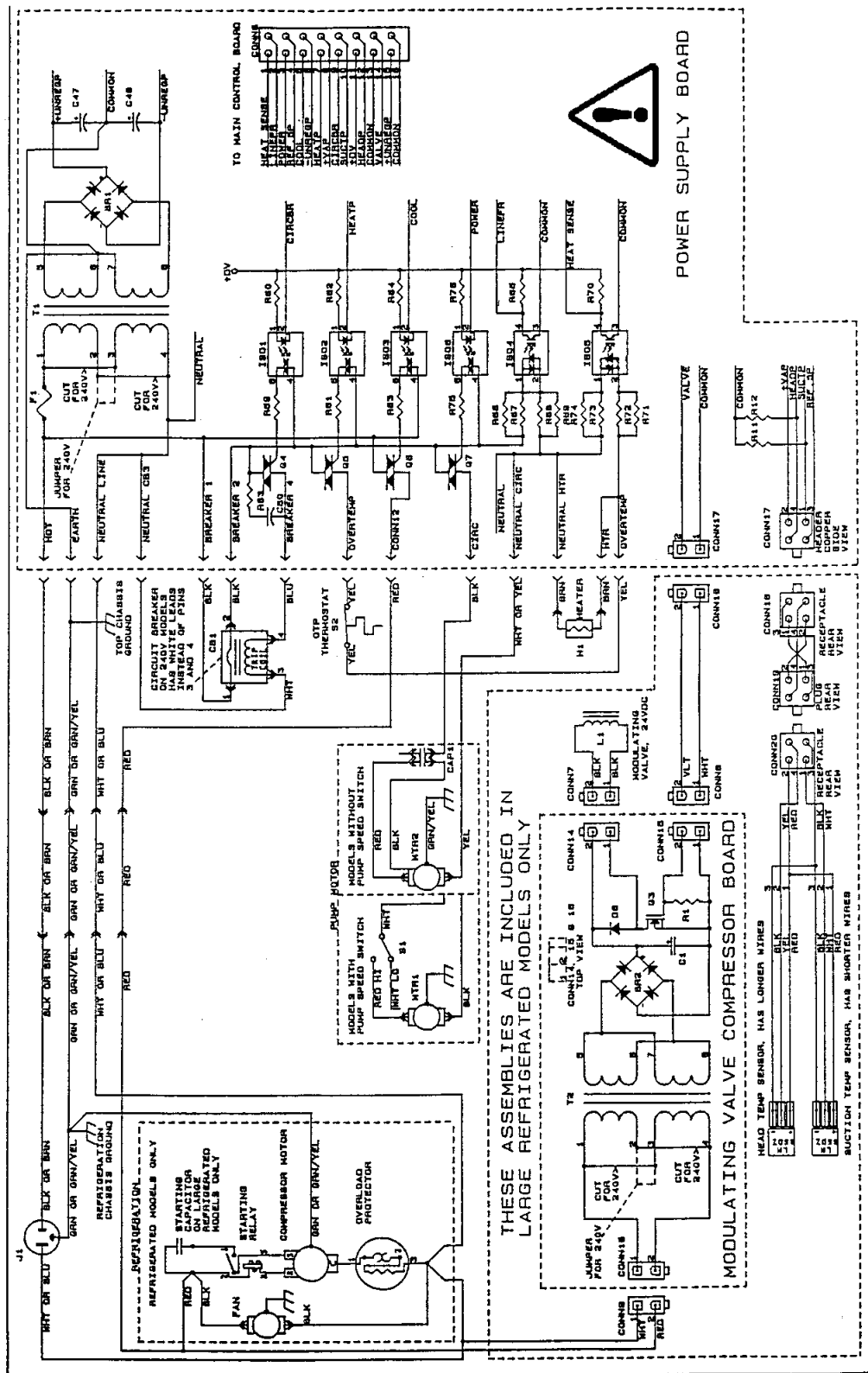
SECTION 6. SCHEMATICS & WIRING DIAGRAM



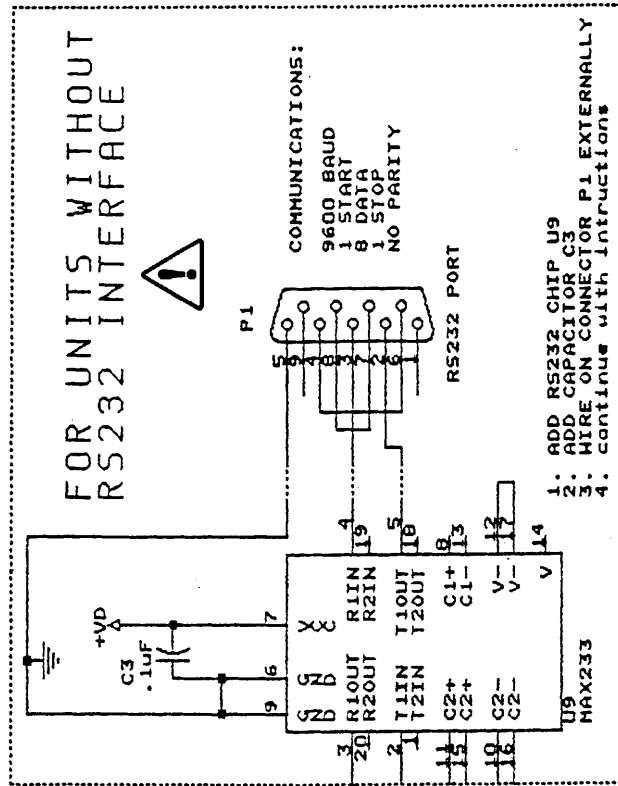
Schematic DTC Display Board



Schematic Main Control Board



Schematic Power Supply and Wiring Diagram



Schematic RS232