advanced temperature control technology

MYDAX, INC.

INSTRUCTION / OPERATION MANUAL

1M150W WATER COOLED CHILLER

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1M150W

SPECIFICATIONS

SYSTEM CAPACITIES

Net Cooling Capacity at +11°C (+52°F)	43,988 Watts or 150,000 Btu/hr
Fluid Temperature Setpoint Range	+8°C to +40°C
Temperature Stability	± 0.5°C
Recirculating Flow/Pressure	40 GPM @ 50 PSI Includes flow indication relay contacts.
Polypropylene Reservoir Volume	44 Gallons
Recirculating Fluid	Deionized Water
Deionization Maintenance Loop	Automatically maintains water resistivity at a minimum or 300K Ohms
Recirculating Supply/Return Fittings	2" Stainless Steel FPT
Facilities Supply/Return Fittings	1" Stainless Steel FPT
Facilities requirements	up to 14 Gpm @ 70°F (7 Gpm @ 40°F), 20 PSI differential
Electrical Service	460/480 VAC, 60 Hz, 3 phase, 50 amp service
Physical Parameters	65" H x 36" W x 58" D, 1000 lbs dry weight

STANDARD FEATURES

This chiller is complete with our computer-controlled low-stress, refrigeration circuit, recirculating pump and fluid reservoir. R-134A refrigeration circuit uses all-brazed construction for extra strength. The heavy-duty frame is constructed of welded steel tubing.

The microprocessor-based control system includes an extensive computer monitoring capability including comprehensive controls, error messages and diagnostics. System status is indicated via a two-row (40 characters each) alphanumeric LCD (liquid crystal display) and with red light-emitting diodes (LED's). The control keyboard employs membrane switches with a sealed polycarbonate overlay for protection from liquid spills.

SAFETY AND ENVIRONMENTAL CONCERNS

Your Mydax chiller was designed to give years of trouble-free operation. Features were designed into the unit to provide early warning of failure mechanisms so that catastrophic failures can be avoided. Whether a chiller is at the factory or in the field, diagnostic information gives Mydax engineers insight to the operation of each stage of the refrigeration and recirculation circuits without having to attach service gauges.

1. Warning & Error Messages: including coolant over-temperature warning & shutdown, low tank level warning & shutdown and others (see ERROR MESSAGES section).

2. System Diagnostics: including coolant & refrigerant temperatures, valve drives and parameters (see DIAGNOSTIC DISPLAYS section).

3. Hardware safeguards include a series-wired interlock circuit that protects refrigerant high pressure, thermal protection of the pump and compressor motors.

Safety is important when using and servicing the chiller unit. Warning labels have been placed on the chiller in areas where potentially harmful conditions exist and in this manual to bring attention to such conditions. This chiller uses materials that are subject to environmental regulations; be sure to familiarize yourself with these components and their associated regulations pertinent to your location.

Warnings have been categorized according to the following guide:

! NOTICE Provides information that is important for proper installation, operation, or maintenance, but not critical to safety. Includes regulatory notices.

! CAUTION Identifies situations where improper action could cause damage to the equipment or product, or cause minor physical discomfort.

! WARNING Identifies situations where improper actions could cause minor to moderate injury or impaired health.

! DANGER Identifies potentially lethal hazards, where improper actions could cause death, or serious injury or disability, such as loss of sight or limb.

Label 1

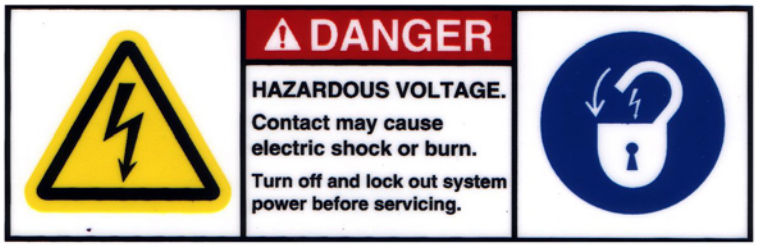
This "Hot Surface" caution label has been placed on the inside of the chiller cabinet, near the compressor's discharge area where the hot compressed refrigerant makes components as hot as 120°C. This label is placed on the Oil Separator and the Muffler as well. The label indicates that the area is hot and should not be touched until the unit is allowed to cool down.

There are potentially hazardous materials within the cabinet; see the MSDS, in Appendix C of this manual, for more information on these materials.

This chiller contains fluids that may be slippery if spilled on the floor. The use of a drip pan may be required as a means of avoiding a potentially hazardous spill. Clean up of any spills should follow the guide provided in the MSDS.

Service of the refrigeration equipment shall be performed only by qualified and certified, if necessary, personnel. Refrigerant gas is not to be vented to the atmosphere; it shall be handled according to regulations set forth by the local environmental authorities. Refrigerants are fluorocarbon type materials and subject to environmental regulations.

The compressor uses POE oil; this MSDS is available from Mydax upon request. The compressor is hermetically sealed and no service should be required. In the event that cleanup is necessary, absorb oil with oil absorbent material and dispose of as a hazardous waste. Follow approved cleanup procedures as listed in the MSDS.



Label 2

This "Hazardous Voltages" danger label has been placed on the clear guard inside the electrical panel box and on each power junction box within the chiller cabinet. The label indicates that there are hazardous voltages on the components within the protective enclosure. Before servicing, the equipment shall be disconnected from the source supply and locked out with an appropriate device.

Electrical maintenance shall be performed only by qualified electricians and trained service personnel.

LITHIUM BATTERY

The M1001 controller contains a Lithium battery to retain setup parameters and calibration data. If this battery were to fail (see Test Panel 7 in the Diagnostic Displays section of this manual), it shall be replaced with a compatible type, and the replaced battery shall be recycled as required by local environmental regulations.

SYSTEM OVERVIEW

System Fluid Schematic

REFRIGERATION

Refer to drawing #D2914, the fluid (refrigerant & coolant) schematic. The heart of this design is the refrigerant valves, shown at the left side of the drawing. These are pulse-width-modulated valves, controlled directly by the system's embedded microprocessor. By controlling the duration of the openings of the evaporator valve, a precisely determined flow of refrigerant is sent to the evaporator, allowing for exceptionally stable recirculating temperatures. This system is designed to control the recirculating output temperature to ±0.5°C or better.

The microprocessor sets the positions of the evaporator valve based upon the system heat load. If the load increases, the evaporator valve is opened for longer durations, passing more refrigerant. If the load decreases, the evaporator valve is opened for shorter durations, passing less refrigerant. The microprocessor controls the bypass valve independently, shunting unneeded refrigerant through the bypass heat exchanger, where it is evaporated before it can reach the evaporator. The superheat valve passes only enough refrigerant to maintain the proper gas temperature at the suction inlet of the compressor. Using this technique, Mydax is able to run in load conditions of zero to full load and all combinations in between.

During normal operation, the durations of the valve openings remain nearly constant. Only major changes in heat load or system-wide power cycling cause large changes in the valve drives. In the case of a step-wise change in heat load, the microprocessor quickly drives the valves to the new settings and refrigerant flow soon settles at the proper level.

The controller sets the valve drives based primarily upon data received from RTD's (resistance temperature devices) located about the circuit. The drawing shows RTD's at the discharge line leading from the recirculating pump, at the return line leading to the reservoir, between the condenser and receiver and at the compressor inlet. The controller reads these and other sensors constantly and sets the refrigerant valves accordingly.

Thus refrigerant flow is truly proportioned, allowing continuous compressor operation without the normal addition of pressure-actuated hot gas bypass valves. All other refrigeration circuit components are used as in conventional systems. All permanent copper joints in the refrigeration circuit are brazed for extra strength. Much of the circuitry is insulated to eliminate cooling capacity loss and unpredictable operation due to drafts or fluctuating ambient air conditions.

RECIRCULATION

This system is designed to recirculate deionized water. It is not designed to recirculate solutions of automotive antifreeze. Approximately 50 gallons are required to fill the 44 gallon polypropylene reservoir and associated plumbing. The reservoir is fitted with two level sensors; one level sensor drives a FILL TANK alarm at the main panel, indicating coolant level has dropped somewhat. The second sensor, the TANK EMPTY sensor, is connected to the safety interlock loop and shuts the system down if tripped.

By using the data from the in-line turbine flow meter, the microprocessor will engage the Flow-OK relay at the selected GPM. The output of the relay is wired to a connector located on the rear panel of the unit, labeled "Flow OK", which can be used to drive an external alarm. Further description of this is provided in the *Installation* chapter.

The system is equipped with a deionizing filter; water flow through the filter is controlled by the microprocessor to maintain the water resistivity to between 300K and 500K ohms. The control algorithm will turn on the DI flow solenoid below 300KΩ and turn it off above 500KΩ. Bypass flow through this filter is restricted to 0.5 GPM.

System Electrical Diagram

Refer to drawing #D2923, the system electrical diagram. The central component of the electrical system is the M1001 controller. It is microprocessor-based and communicates with and/or controls various other circuit boards and components. Most controller circuitry is laid out on circuit boards mounted in the main control cabinet. The controller is powered as long as the system circuit breaker is set, receiving 24 VAC power from a bulkhead-mounted transformer. The controller "reads" the RTD's in the system via board M1002, the Input Circuit Board, mounted on the frame. RTD's are included for the recirculating temperatures, as well as for the refrigerant circuit. Also routed through the M1002 board are the 100 Ohm and 120 Ohm precision RTD calibration resistor circuits. The refrigerant valve drive signals and the phase monitor circuit are routed through the M1004 power board.

The system interlock loop is controlled by the M1002 board. In this application the interlock loop consists of the refrigerant over pressure switch, the TANK EMPTY level sensor, one power relay coil and a relay pole (RL1,B). The RESET switch serves to feed power to the relay, which energizes the contactor. When energized, the contactor feeds power back to the relay so the RESET switch may open up without cutting off power to the relay. If the refrigerant switch or the level sensor trips, power to the loop is interrupted. The microprocessor senses this via the contactor connection at pin 23 of the M1002 board. Provided the system has power, if the loop trips out, the controller drives the PUSH RESET error message. Other diagnostic messages are also sent if the level sensors are tripped. The loop must be reset when the fault condition, if present, is resolved.

The M1002 board also routes signals for the FILL TANK level sensor. If this sensor trips, the controller displays the FILL TANK error message. A compressor crankcase heater is provided and is powered as long as the system circuit breaker is set and AC line voltage is present.

The M1003 board reads the DI resistivity probes; the DI solenoid valve is driven from a digital output from the M1004 board.

A special feature exists on the M1010 board which engages a relay at a user-defined flow rate. The output of the relay is wired to a BNC connector located on the rear panel of the unit, labeled "Flow OK". Further description of this is provided in the *Installation* chapter.

INSTALLATION

POWER CONNECTION

Main electrical power connections to this system are made via a ten foot long power cord with a CS8165C plug. This chiller requires a 50 amp circuit, 460/480 volt, 60 Hz, 3 phase.

DANGER: Prior to any electrical servicing inside either the power box or the chiller cabinet, disconnect the power cord and lockout the main breaker with a lockout device.

Once the unit is wired and plugged in, turn on the main circuit breakers mounted on the front of the system. The unit will not run without the proper phase wiring, if the display flashes "AC Power Fault", unplug the cord and swap two of the phase lines and re-check.

A message similar to the following appears on the 2 by 40-character main display:

```
Tank    --- Warmup Delay ---  Local Set
12.10°C   0.0 Gpm    400KΩ       12.0°C
```

This display indicates that the microprocessor is initializing. After a few seconds, the controller will finish initializing and the "Warm-up Delay" message will return to simply "Mydax". Leave the unit turned on while hooking up the following plumbing connections. This will allow time for the crankcase heater to warm the compressor and separate the oil from the refrigerant.

WARNING: The system should be powered for a period of 1 hour before starting, to allow the crankcase heater to separate the refrigerant from the oil.

CONDENSER FLOW

The condenser inlet and outlet fittings are 1" stainless steel female pipe thread fittings (FPT). Plumb the facilities cooling water supply to the fitting marked **CONDENSER IN**. Plumb the facilities water return line to the **CONDENSER OUT** connection. Given a facilities inlet temperature of +70°F, this chiller requires a flow of up to 14 gallons per minute.

PLUMBING INTERFACE CONNECTIONS

The chiller's 2" stainless steel FPT fitting labeled **TANK OUT** must be plumbed to the inlet of the device to be cooled. The outlet of the device to be cooled must be plumbed to the chiller's 2" FPT fitting labeled **TANK IN**.

This system is equipped with a 1/2" FPT fitting labeled **DRAIN**. A valve should be installed at this location prior to the initial filling of the reservoir, for the convenience of future draining procedures. The recirculating loop is under pressure when the system is operating.

Check all fluid interface connections now to ensure against leaks.

FILL RESERVOIR

This unit is designed to recirculate deionized water. To fill the system's reservoir, use a funnel or insert a hose in the 1-1/2" fill port on the top of the reservoir and fill until the "Fill Tank" message is not present. Add approximately 2 gallons of fluid after the "Fill Tank" message goes away to avoid nuisance alarms.

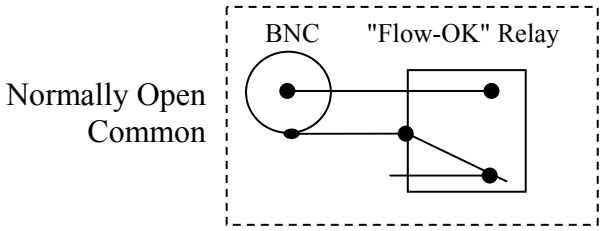
! CAUTION: DO NOT USE AUTOMOTIVE ANTIFREEZE, residue build up will cause damage the unit's critical components.

PUSH RESET BUTTON

The RESET button, located below the front panel, must be pushed after an error in the interlock circuit occurs prior to restarting the system. This resets the power safety interlock loop, which protects the operator and electrical circuitry.

EXTERNAL "FLOW-OK" RELAY CONTACTS

This unit is equipped with a normally-open relay for an external flow indication. Located on the rear panel is a BNC connector, labeled "Flow-OK"; the outer shield is common, inner pin is the normally-open contact. When an adequate flow condition is satisfied, the relay will close the contacts. This feature's trip-point is settable from 5 to 20 GPM on Test Panel 6; see description in the DIAGNOSTIC DISPLAYS section of this manual, under TEST PANEL 6.



OUTPUT FLOW ADJUSTMENT VALVE

To adjust the flow and pressure of the recirculation loop, adjust the valve on the rear of the unit labeled "Water Flow Adjustment Valve". The 100 PSI “Output Pressure” gauge, located on the rear bulkhead, will indicate the output pressure after the valve. The pressure gauge labeled “Pump Pressure” indicates the internal pump pressure. The flow rate is visible on the front LCD display panel.

BYPASS VALVE

To divert the recirculation flow from the output path back to the tank, first open the Bypass valve, then close the output flow adjustment valve. To return from this mode, reverse the procedure; always keeping adequate flow through the flowmeter. If the flowmeter sees less than 10 GPM flow, the chiller will shut down to protect the pump.

An integrated pressure switch will shut down the chiller at an output pressure of 65 psi; if the backpressure is near 60 psi, this bypass valve should be opened when starting the pump to prevent the switch from kicking out.

DEIONIZATION FILTER

The system is equipped with a deionizing filter; water flow through the filter is controlled by the microprocessor to maintain the water resistivity between 300K and 500K ohms. On a yearly basis, or if the unit is unable to maintain resistivity to acceptable level, replace with Mydax part# F1003. This mixed-ion resin cartridge filter is only available from Mydax.

25 MICRON PARTICLE FILTERS

On the rear of the chiller is two 20 inch particle filters; the two filters are plumbed in parallel to reduce the pressure drop at the designed high flow volume. Maintenance of these filters shall be to replace them with like type (DGD-2501-20) when or if the available flow and/or pressure becomes unacceptable. This time period will depend on the application and usage, as well as the cleanliness of the system.

FRONT PANEL CONTROLS

All Mydax chillers are controlled by a microprocessor which is accessed via the system control panel. System controls are simple, yet powerful and in concert with built-in diagnostics and error messages, are exceptionally comprehensive.

POWER LED: Indicates unit is powered (the circuit breaker is set).

RESET: Must be pressed prior to system start-up to energize the interlock loop.

DISPLAY:

Tank	--- MYDAX ---		Local Set
21.50°C	40.0 Gpm	400KΩ	25.0°C

Shows the actual Output Temperature and Setpoint Temperature in °C. Also indicates that the local SET TEMPERATURE MODE can be enabled. Additionally, the recirculation flow rate is displayed in gallons-per-minute (Gpm), as well as the water resistivity.

START: Starts compressor and pump and turns on LED's.

STOP: Stops both the compressor and pump.

MUTE ALARM: May be used to deactivate audible alarm for 10 minutes, leaving alarm LED on. Pressing the CLEAR key reactivates the alarm, which sounds until the fault condition is eliminated or the MUTE ALARM switch is depressed again. Pressing MUTE ALARM when no alarm is active causes the alarm to sound once and the TEST ALARM display to appear.

SET: Enables SET TEMPERATURE MODE. SET MODE is disabled from panel if an alarm is active or if the unit is in REMOTE. To set, depress:

- **SET:** "Set Mode" appears at the right of the display. Cursor flashes at "units" digit of the temperature display.
- **ARROWS KEYS:** Changes temperature setting in one degree increments unless "." (decimal) key is depressed.
- **"." (DECIMAL):** Moves cursor to the "tenths" digit of the temperature display and causes arrow keys to change setting in tenths of a degree.
- **KEYPAD:** Changes temperature setting by entering numbers directly.
- **CLEAR:** Erases an incorrect entry.
- **ENTER:** Selects temperature setting and deselects SET mode.

TEST: Initiates Test Mode. See description under DIAGNOSTIC DISPLAYS section of this manual.

ENTER: Enters temperature selections while in the SET mode.

CLEAR: Erases incorrect temperature selections; exits Test Mode; clears Mute Alarm selection.

MODE: Toggles between the optional RS-232C remote control mode, when present, and Local Set mode.

ARROW KEYS: Changes temperature setpoint by 0.1°C or 1°C increments/decrements; toggles tank temperature, setpoint temperature and evaporator data view modes for multiple channel systems.

"." (DECIMAL): Display shows model number and software revision date and copyright:

```
Model #                    Date
Copyright 2003 Mydax, Inc.
```

RUN PUMP: Inactive in this system..

X & Y: For future use.

Z: See Test Panel 9 in the Diagnostic Displays Section.

ALARM & RROR MESSAGES

A unique feature of Mydax systems is the error messages displayed on the 2 by 40-character liquid crystal display (LCD). The microprocessor constantly checks various points and parameters throughout the system and automatically displays messages when error conditions are sensed. Many displays are announced by an audible alarm and LED indicator. The error message persists until the fault condition is resolved, provided that the fault condition was not fatal, resulting in a system shutdown.

Condenser Hot Indicates high discharge pressure condition with temperature over +50°C. This is a warning message only. A separate mechanical over pressure switch, part of the safety interlock loop, shuts the system down in case of an over pressure condition. The purpose of this message is to allow maintenance workers to correct the problem at an early stage. (Caused by a clogged filter, low or warm condenser cooling water flow or condenser scale build-up.)

Fill Tank #1 Indicates low tank liquid level; this is a warning message.

Extreme Temp Indicates that the reservoir temperature is either more than 10°C above the highest allowable setpoint (+50°C) or that it is too close to freezing (+4°C). The microprocessor shuts down the system with a fatal alarm.

Push Reset Indicates that a fatal alarm in the interlock circuit has occurred and the operator must push the "Reset" button on the front face of the chiller in order to restart the system.

A series-wired safety interlock loop protects all Mydax systems, disconnecting AC power from nearly all circuitry. The loop consists of the refrigerant pressure switch and the "tank empty" float switch. If any link in the loop is opened, the "Push Reset" error message is displayed. Once the fault is corrected, the Reset button must be used to re-establish loop integrity.

AC Power Fault: Generated by the Line Voltage Monitor, the system is shut down to prevent damage due to: low AC voltage (<440V) or unbalance (4% for > 5 seconds), phase loss or phase reversal (> 100 milliseconds). On initial power-up, reverse two lines to achieve proper phase sequence.

Low AC Line Indicates a low voltage condition exists on the input AC line.

Open RTD Indicates that an RTD connected to the M1002 Input Board has failed and that the system has shut down to prevent damage due to lack of data. The RTD at fault may be located by accessing Test Panel 8. The RTD must be replaced for the system to operate again.

Low Flow Indicates that the flow rate, in the recirculation loop, is lower than 5GPM; this is a value set in the firmware. This shuts down the chiller, with a fatal alarm, to protect the pump.

DIAGNOSTIC DISPLAYS

Mydax chillers are provided with a computerized self-diagnostic capability. This system is equipped with 9 different test panels, which are accessed by pressing the TEST key, followed by the test panel number. Diagnostic mode is terminated by pressing the CLEAR key, and results in a display similar to that below:

MAIN DISPLAY:

```
Tank          --- MYDAX ---      Local Set
24.95°C    35.8 Gpm      400KΩ     25.0°C
```

Diagnostic messages are displayed on the main 2 by 40-character LCD. Display 5 automatically appears when the TEST key is first depressed. Once in diagnostic mode, other displays can be selected by depressing number keys 1 through 9. The following describes each of the test displays:

TEST PANEL #1:

```
 Valve          5          11  18  Htr   0
Avg Valve       0           6  15  Htr   0
```

Numbers represent the drive signals for the evaporator, bypass and superheat valves and tank heaters. Heater values are inactive in this system. The range is 0 (minimum) to 20 (maximum drive). Each digit represents 5% of the available 24V drive voltage. Avg Valve shows a 32 second running average of the valve's drive, displayed above it.

TEST PANEL #2:

```
-5.0°  -11.4°  25.5   13.5°   8.0°   38.4°
Limit   Suct   Psia  Sup.Ht  SHavg. Condr
```

This display shows the refrigerant circuit RTD temperatures in °C. The display reads:

Limit = Max Evaporator Temp Suct = Suction Temp Psia = Suction Pressure (absolute)
Sup.Ht = Superheat Temp SHavg = Avg Super Ht Temp Cond = Condenser Temp

The condenser reading is a direct indicator of condenser temperature and pressure. The microprocessor sends the CONDENSER HOT error message if the condenser temperature exceeds +54°C.

TEST PANEL #3:

```
302B  0000  0000  Z 0.00  G  51.95   8.0
SS-1  SS-2  SS-3 RTD Reference    SH Avg
```

The first 3 sets of 4-digit numbers are hexadecimal. They represent correction values for the slow gain servos for up to 3 reservoirs. The function of this servo is to dynamically adjust the main temperature control servo to near zero error and thereby maintain temperature stability.

The first 2 digits in each set of 4 show the gain offset. Each increment equals 0.05°C, so 14 Hex = 20 decimal = 1.0°C. This value is internally subtracted from the operator-entered temperature set point if the actual temperature is above the set point, thus reducing the coolant temperature. The set point offset is continuously monitored by the controller and adjusted according to current conditions.

The second 2 digits in each set of 4 show the time prescaler. This is a counter which increments or decrements once a second and times the next update of the set point offset. A typical value is 20 seconds per offset change. When the count reaches "00", the offset may or may not be changed and the count resets to "0A" Hex (10 decimal). Together these numbers show that the controller is internally changing the control set point to

maintain temperature stability, and give the magnitude and timing of the change.

The center of the display shows readings for the RTD "Zero" and "Gain" calibration resistors. Precision 100Ω and 120Ω resistors (0.1% tolerance or better, representing ideal nominal RTD's) are used as a reference.

TEST PANEL #4:

```
-2.583 -0.000 -0.000  +24.13   0   255
 Ext 1  Ext 2  Ext 3    VAC        Secs
```

This display shows auxiliary voltmeter readings of Ext 1, Ext 2 and Ext 3. Ext 1 is the voltage reading from the integrated flowmeter. Ext 2 and Ext 3 are unused. VAC is the 24 VAC internal control voltage. A typical value is in the range of 22.00 to 28.00. To the right of this value is an unused single-digit number ranging from 0 to 3. At the far right of this display is a time indicator in seconds. The timer stops at 255 seconds and is used internally for turn on routine procedures.

TEST PANEL #5:

```
   24.95   25.0     0.0
   Tank    Set      DgMin
```

This diagnostic shows the **Output** (Tank) RTD temperature in °C, the Output Setpoint temperature and Output temperature slope. Slope is a measure of the direction and amount of the output temperature change per 60 seconds.

TEST PANEL #6:

```
   15                                12.45°C
Flow Relay Gpm                       Input
```

This panel shows the trip point, above which, the Flow-OK contact is engaged; the trip-point is settable from 2 to 25 GPM by using the UP/DOWN (↑,↓) arrows on the keypad. By using the data from the in-line turbine flow meter, the microprocessor will disengage the Flow-OK relay below the selected GPM. The output of the relay is wired to a BNC connector, labeled "Flow OK", located on the rear panel of the unit. The shield and center pin are the normally-open contact, which closes when flow is above the trip point.

The temperature of the **Input** fluid (return) to the chiller is monitored by an RTD, and displayed here for reference. See the drawing *Chiller Fluid Schematic* at the end of this manual.

TEST PANEL #7:

```
- 0.432  -0.000  -0.000   R134A - 5.00  0
+ 0.485  -0.000  -0.000          Bat. OK
```

This left-most six numbers of the display shows voltmeter readings for up to 3 optional water resistivity monitor interface raw data outputs. Only the first column is used in this system.

The refrigerant type that the control system is calibrated for is shown. For example: **R134A**

The two numbers at the top, far right-hand side of this display represent the internally computed maximum evaporator temperature and a counter ranging from 0 to 99, which are used to adjust the valve drives and regulate the superheat temperature.

The second line of the right side of this display indicates the status of the lithium battery, mounted on the M1001 circuit board, used to run the system's elapsed run-time clock depicted in Test Panel 8 and the run/event recorder depicted in Test Panel 9. A "Bat. OK" message indicates that the battery is operational, while a "No Bat." message indicates that the battery is dead and should be replaced.

TEST PANEL #8:

```
Alarms:        Fill Tank !
                KEY     Run 356d 11:31:25
```

The top left side of this display shows the alarm (error message) history. If there have been no alarms since the last history reset, the display reads "No Alarms". If alarms have occurred, the display shows them in sequence, like the main display. The history can be cleared 3 ways:

1. Power Off/On
2. Press START Key when unit is stopped
3. Press 0 Key when viewing Test Panel 8

The second line of the display can be read when the chiller is stopped. It indicates the reason that the chiller was last stopped: KEY, FATAL, RS232 or EXT. The right side of the second line indicates the elapsed run time on the system in days (from 0 to 9999), hours, minutes and seconds. This system is equipped with a battery which, if operational, saves the elapsed run time value when the system is stopped and restarted. The elapsed run time is reset each time the system is restarted.

TEST PANEL #9:

```
T-   0:24   14.95   15.0   No Alarms.....
Tank1 -11.4Ev -59By 38Cd 13Sh 8SA 5.8Gpm
```

This display provides run/event recorder data. The run/event recorder continuously records important information into a non-volatile memory while the system is operating. Data is stored at one-second intervals for the last 120 seconds of run time and it is also stored at two-minute intervals for the last 240 minutes of run time.

The first line of this display indicates the run time in hours, minutes and seconds prior to the last system shutdown, the output and setpoint temperatures of whichever recirculating channel was last selected at the Main Display and the system-wide alarm history. The second line indicates which recirculating channel was last selected at the Main Display, the evaporator, bypass, condenser and superheat RTD temperatures in °C, the average superheat temperature from Test Panel 3 and the flow rate. Both the evaporator temperature and the flow rate are specific to the recirculating channel being viewed. All refrigerant circuit RTD temperatures are truncated to the nearest 1°C for this display.

After the system is stopped and Test Panel 9 is selected, the memory is displayed at the last or most recent second (T- 0: 0: 0). The downward arrow key can be used to decrement time into the past. There are 120 "1-second slots" and 120 "2-minute slots". If the downward arrow key is held down, the time slots decrement at the rate of two slots per second. The upward arrow key increments to more recent time slots. If the "Z" key is depressed, the display goes to the oldest 1-second slot (T- 0: 1:59 if the actual run time was of at least that duration). If the "9" key is depressed while viewing Test Panel 9, the display reverts back to "T- 0: 0: 0", the stop time.

The alarm messages are accurate for the slot that is current. If the display is on the minutes slot, then the alarms indicated are any which have occurred during that 2-minute interval. Alarm messages cycle or flash in an identical fashion to those appearing in either the Main Display or in Test Panel 8.

SERVICE & WARRANTY

If a unit malfunctions, please contact the Mydax Service Department as soon as possible. Many small problems can lead to large problems if not dealt with immediately. Please have the serial number and model number on hand when calling.

Mydax Service Department: (530) 888-6662 FAX: (530) 888-0962
Email: service@mydax.com

RETURN OF UNIT FOR SERVICE

Many problems may be repaired by field exchanges of a module, pump, controller, etc. If return is required, please obtain a return authorization number from the Mydax Service Department or the unit may not be accepted at our receiving dock.

Please refer to the shipping instructions which follow.

SERVICE OF REFRIGERATION UNIT

Nearly all repairs to the refrigeration unit involve brazing or silver soldering. This should only be done by a person trained in refrigeration service and familiar with the Mydax system.

NOTE: Before servicing any refrigeration unit involving brazing, remove all refrigerant from the system. Evacuate to a 400 micron vacuum to remove refrigerant residues, then open all service valves to dry air or dry nitrogen before use of a torch.

In particular, service of Mydax refrigeration circuits requires attention to the following:

1) Use caution to protect components from heat damage.

2) Prevent any moisture from entering the circuit, as Mydax proportional valves do not function with moisture present. Once moisture has entered the system it cannot be removed.

3) Remove insulation and instrumentation wiring or use heat shields to protect them from torch heat during work.

4) Before recharging the circuit, evacuate it to 200 microns at a minimum room temperature of 75°F for three hours, or longer for units with 4 horsepower or larger compressors.

ONE YEAR WARRANTY

Mydax, Inc. warrants that its temperature control system, and the component parts thereof, will be free from defects in workmanship and materials for a period of one year from the date of delivery. In the event that warranty service is required, the customer is requested to send the equipment freight prepaid to the factory for service. Mydax will then perform the appropriate service and will return the equipment freight prepaid.

If field service is required during the warranty period, the customer will be responsible for all travel expenses including airfare, car rental, lodging and meals. The customer will not be invoiced for any warranty service performed, with regard to either labor or materials, during a field service visit.

RESHIPPING & LONG-TERM STORAGE PREPARATION

Reshipped systems should be protected from freezing temperatures in shipment or during long-term storage, or serious damage may result. Freezing temperatures can be encountered in air and over-mountain surface shipments in any month of the year.

In-transit freeze-up can occur in the recirculating coolant loop and in a water-cooled condenser's water circuit. To protect against freezing, all water must be removed from these circuits, or ethylene glycol must be added.

This system has a **water-cooled** refrigeration condenser. The following instructions apply to shipment or long-term storage preparation:

1) If the system has been run with water, ethylene glycol should be added to the recirculating loop. Verify that the concentration of ethylene glycol approaches 50% (measure with a hydrometer) in the recirculating loop before draining.

2) Once the proper ethylene glycol concentration has been attained, the mixture should be drained from the recirculating loop. The system is provided with a DRAIN fitting for this purpose. Remove as much coolant as possible to prevent ice-up in the small "nooks & crannies" of the plumbing.

3) As much coolant as possible should be drained from the system before shipment. Coolant adds significant shipping weight and may damage electrical parts if it sloshes out of the tank.

4) Plug the TANK IN, TANK OUT, FILL and DRAIN fittings to avoid leakage of any residual coolant during shipment or storage.

FAILURE TO PERFORM THESE STEPS
PRIOR TO SHIPMENT MAY VOID THE WARRANTY.

Call Mydax for shipment preparation help, if needed, at (530) 888-6662