Operating Manual

OM CentrifMicro II

Group: **Chiller**	
Part Number:	
Effective: **April 2002**	
Supersedes: **New**	

MicroTech II™ Controller

For Centrifugal Chillers and Templifiers™

Draft
Release #3
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Release 1.02.04

McQuay
Air Conditioning

Table of Contents

ISO 9002 CERTIFIED

Introduction

This manual provides setup, operating, and troubleshooting information for the MicroTech II™ controller for McQuay centrifugal chillers. Please refer to the current version of IOMM WSCWDC, WPV, or TSC for information relating to the unit itself.

⚠ **WARNING**

Electric shock hazard. Can cause personal injury or equipment damage. This equipment must be properly grounded. Connections to and service of the MicroTech control panel must be performed only by personnel that are knowledgeable in the operation of the equipment being controlled.

⚠ **CAUTION**

Static sensitive components. A static discharge while handling electronic circuit boards can cause damage to the components. Discharge any static electrical charge by touching the bare metal inside the control panel before performing any service work. Never unplug any cables, circuit board terminal blocks, or power plugs while power is applied to the panel.

NOTICE

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with this instruction manual, may cause interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. McQuay International Corporation disclaims any liability resulting from any interference or for the correction thereof.

Temperature and humidity considerations

The MicroTech II controller is designed to operate within an ambient temperature range of -20°F to +149°F (-29°C to +65.1°C) with a maximum relative humidity of 95% (non-condensing).

Features of the Control Panel

- Control of leaving chilled water within a ±0.2°F (±0.1°C) tolerence.
- Readout of the following temperature and pressure readings:
  - Entering and leaving chilled water temperature
  - Enter and leaving condenser water temperature
  - Saturated evaporator refrigerant temperature and pressure
  - Saturated condenser temperature and pressure
  - Outside air temperature (optional)
  - Suction line, liquid line and discharge line temperatures - calculated superheat for discharge and suction lines – calculated subcooling for liquid line
  - Oil sump temperature - oil feed temperature and pressure
  - Optional condenser heat recovery temperature
- Automatic control of primary and standby evaporator and condenser pumps.
- Control of up to 4 stages of cooling tower fans plus modulating bypass valve and/or tower fan VFD.
- History trend feature will constantly log chiller functions and set points. The controller will store and display all accumulated data for recall in a graphic format on the screen. Data can be exported for archival purposes via a 3.5-inch floppy drive.
- Three levels of security protection against unauthorized changing of setpoints and other control parameters.
- Warning and fault diagnostics to inform operators of warning and fault conditions in plain language. All warnings, problems and faults are time and date stamped so there is no guessing of when the fault condition occurred. In addition, the operating conditions that existed just prior to shutdown can be recalled to aid in isolating the cause of the problem.
- Twenty-five previous faults and related operating conditions are available from the display. Data can be exported for archival purposes via a 3.5-inch floppy drive.
- Soft loading feature reduces electrical consumption and peak demand charges during loop pulldown.
- Adjustable load pull-down rate reduces under-shoot during loop pulldown.
- Remote input signals for chilled water reset, demand limiting, unit enable.
- Manual control mode allows the service technician to command the unit to different operating states. Useful for system checkout.
- BAS communication capability via LONMARK® or BACnet® standard protocols for all BAS manufacturers.
- Service Test mode for troubleshooting controller hardware.
- Pressure transducers for direct reading of system pressures. Preemptive control of low evaporator pressure conditions and high discharge temperature to take corrective action prior to a fault trip.

General Description

General Description

The centrifugal MicroTech II control system consists of microprocessor-based controllers that provide all monitoring and control functions required for the controlled, efficient operation of the chiller. The system consists of the following components:

- Operator Interface Touch Screen (OITS), one per unit-provides unit information and is the primary setpoint input instrument. It has no control function.

- Unit Controller, one per chiller-controls unit functions and communicates with all other controllers. It is the secondary location for setpoint input if the Interface Screen is inoperative. It is located in a panel adjacent to the OITS.

- Compressor Controller for each compressor on a chiller-controls compressor functions and can operate a compressor without the unit controller or Operator Interface Panel. The controller is located in a panel adjacent to the compressor.

The operator can monitor all operating conditions by using the unit-mounted OITS. In addition to providing all normal operating controls, the MicroTech II control system monitors equipment protection devices on the unit and will take corrective action if the chiller is operating outside of it's normal design conditions. If a fault condition develops, the controller will shut the compressor down and activate an alarm output. Important operating conditions at the time an alarm condition occurs are retained in the controller's memory to aid in troubleshooting and fault analysis.

The system is protected by a password scheme that only allows access by authorized personnel. The operator must enter the password into the touch screen (or one of the controller's keypad) before any setpoints can be altered.

NOTE: It is important to understand that the OITS is the operator interface device under normal conditions. If, and only if, it is unavailable, the unit controller can be used to operate the chiller. Furthermore, if the unit controller is unavailable, the compressor controller(s) will still operate the compressors and try to maintain chilled water temperature. Certain data and operability will not be available under either of these operating modes. If the tower and pumps are controlled by Microtech II, they will have to run manually during this emergency situation.

Control Architecture

Figure 1, Major Control Components
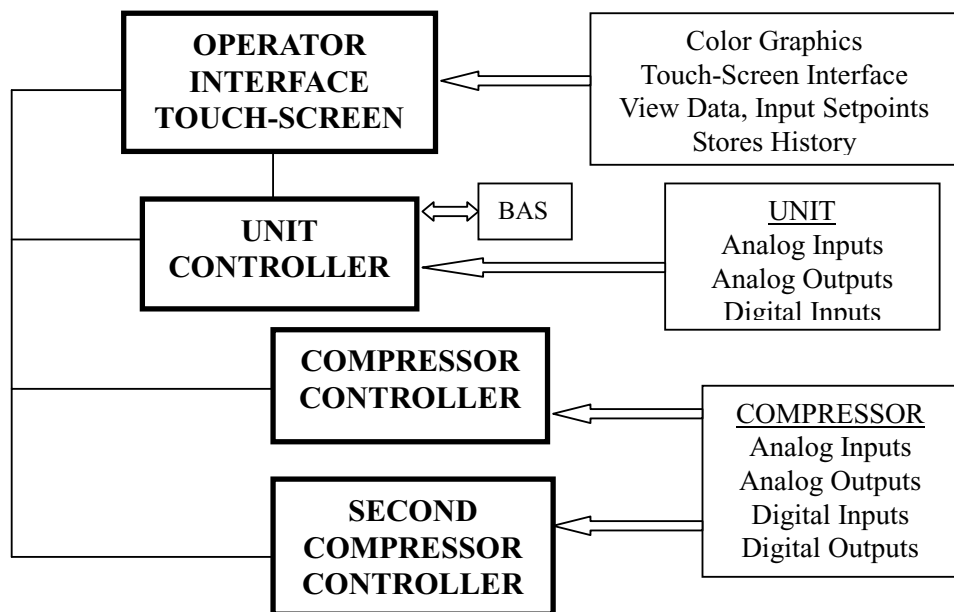
Component Description

Operator Interface Touch Screen

The operator interface touch screen (OITS) is the primary device by which commands and entries into the control system are made. It also displays all controller data and information on a series of graphic screens. A single OITS is used on both single and dual compressor units.

The side of the OITS panel contains a floppy disc drive that can be used for loading information to and from the controll system.

The OITS panel is mounted on a moveable arm to allow placement in a convenient position for the operator.

There is a screen-saver programed into the system. The screen is reactivated by touching it anywhere.

Unit/Compressor Controller Description

Hardware Structure

The controller is fitted with a 16-bit microprocessor for running the control program. There are terminals for connection to the controlled devices (for example: solenoid valves, tower fans, pumps). The program and settings are saved permanently in FLASH memory, preventing data loss in the event of power failure without requiring a back-up battery.

The controller connects to other controllers and the OITS via a local communications network (p-LAN). It also has remote communication access capability for BAS interface.

Keypad

A 4 line by 20 character/line liquid crystal display and 6-button keypad is mounted on the unit and compressor controllers. Its layout is shown below.
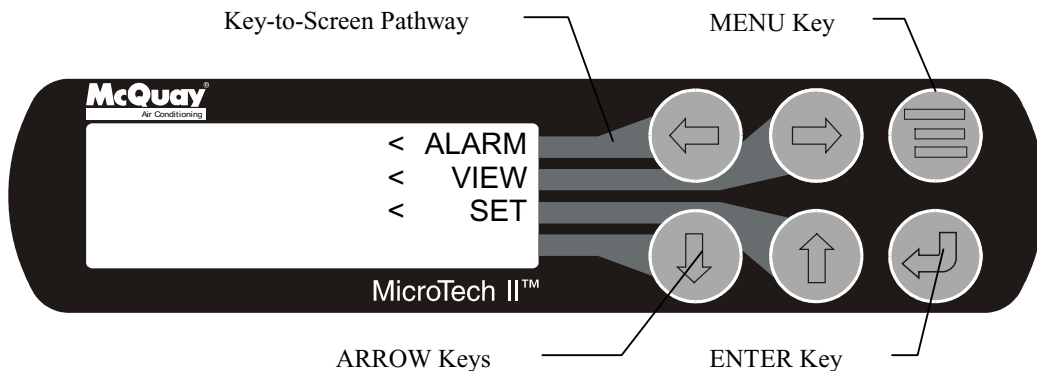
The four arrow keys (UP, DOWN, LEFT, RIGHT) have three modes of use.
- Scroll between data screens in the direction indicated by the arrows (default mode).
- Select a specific data screen in the menu matrix using dynamic labels on the right side of the display such as ALARM, VIEW, etc (this mode is entered by pressing the MENU key). For ease of use, a pathway connects the appropriate button to its respective label on the screen.
- Change field values in setpoint programming mode according to the following table:

LEFT key = Default	RIGHT key = Cancel
UP key = Increase (+)	DOWN key = Decrease (-)

These four programming functions are indicated by one-character abbreviation on the right side of the display. This programming mode is entered by pressing the ENTER key.

Unit Controller

There is one unit controller mounted on the chiller that serves both single or dual compressor units. A "medium" controller is standard and does not include analog inputs 6 through 10 in Table 1and digital outputs 9 and 10 in Table 3. If analog inputs 6 through 10 and/or digital outputs 9 and 10 are required, an optional expanded "large" controller will be supplied.

Unit and compressor on/off switches are mounted in the unit controller panel adjacent to the OITS panel. They are designated │ for on and O for off. The compressor on/off switch should only be used when an immediate stop is required since the normal shut down sequence is bypassed.

The switch panel also has a Circuit Breaker that interrupts power to the cooling tower fans, valves and evaporator and condenser pumps if any of these are tied into the MicroTech II for control of their operation. If these components operate independently from the chiller control, the breaker has no effect.

The unit controller's primary function is processing data relating to the entire chiller *unit* operation as compared to data relating to the *compressor* operation. The unit controller processes information and sends data to other controllers and devices and relays information to the OITS for graphic display. It has a 4x20 LCD display and keys for accessing data and changing setpoints. The LCD can display most of the same information as the OITS and can operate the chiller independently if the OITS is not available. Inputs and outputs are shown in the following tables.

Table 1, Unit Controller, Analog Inputs

#	Description	Signal Source	Range
B1	Reset of Leaving Water Temperature	4-20 mA Current	0-(10 to 80°F)
B2	Entering Evaporator Water Temperature	NTC Thermister (10k@25°C)	-58 to 212°F
B3	Entering Condenser Water Temperature	NTC Thermister (10k@25°C)	-58 to 212°F
B4	Leaving Condenser Water Temperature	NTC Thermister (10k@25°C)	-58 to 212°F
B5	Liquid Line Refrigerant Temperature	NTC Thermister (10k@25°C)	-58 to 212°F
B6	Demand Limit	4-20 mA Current	0-100 %RLA
B7	Evaporator Water Flow	4 to 20 mA Current	0 to 10,000 gpm
B8	Condenser Water Flow	4 to 20 mA Current	0 to 10,000 gpm
B9	Refrigerant Leak Sensor (field supplied)	4 to 20 mA Current	0 to 100 ppm
B10	Entering Heat Recovery Temp.	NTC Thermister (10k@25°C)	-58 to 212°F
B11	Leaving Heat Recovery Temperature	NTC Thermister (10k@25°C)	-58 to 212°F

Table 2, Unit Controller, Digital Inputs

#	Description	Signal	Signal
ID1	Unit OFF Switch	0 VAC (Stop)	24 VAC (Auto)
ID2	Remote Start/Stop	0 VAC (Stop)	24 VAC (Start)
ID3	Mode Switch	0 VAC (Cool)	24 VAC (Ice or Heat)

Table 3, Unit Controller, Digital Outputs

#	Description	Load	Output OFF	Output ON
NO1	Primary Evaporator Water Pump	Pump Contactor	Pump OFF	Pump ON
NO2	Standby Evaporator Water Pump	Pump Contactor	Pump OFF	Pump ON
NO3	Primary Condenser Water Pump	Pump Contactor	Pump OFF	Pump ON
NO4	Standby Condenser Water Pump	Pump Contactor	Pump OFF	Pump ON
NO5	Tower Fan #1	Fan Contactor	Fan OFF	Fan ON
NO6	Tower Fan #2	Fan Contactor	Fan OFF	Fan ON
NO7	(unused)			
NO8	Alarm	Alarm Indicator	Alarm OFF	Alarm ON
NO9	Tower Fan #3	Fan Contactor	Fan OFF	Fan ON
NO10	Tower Fan #4	Fan Contactor	Fan OFF	Fan ON

Table 4, Unit Controller, Analog Outputs

#	Description	Output Signal	Range
Y1	Cooling Tower Bypass Valve Position	0 to 10 VDC	0 to 100% Open
Y2	Cooling Tower VFD Speed	0 to 10 VDC	0 to 100%

Compressor Controller

The compressor controller's primary function is controlling and protecting the compressor. No setpoint inputs are made with it. There is one compressor controller for each compressor on a chiller unit. The compressor controller receives, processes, and sends data to other controllers and devices and to the compressor starter or Variable Frequency Drive (VFD). With some operator intervention the compressor controller can operate the compressor(s) if the unit controller and/or the operator interface touch screen are unavailable. Inputs and outputs are as follows:

Table 5, Compressor Controller, Analog Inputs

#	Description	Signal Source	Range
B1	Oil Sump Pressure	0.5 to 4.5 VDC	0 to 150 psi
B2	Oil Supply Pressure to Compressor	0.5 to 4.5 VDC	0 to 450 psi
B3	Evaporator Refrigerant Pressure	0.1 to 0.9 VDC	0 to 150 psi
B4	Oil Sump Temperature	NTC Thermister (10k@25°C)	-58 to 212°F
B5	Compressor Suction Temperature	NTC Thermister (10k@25°C)	-58 to 212°F
B6	Condenser Refrigerant Pressure	0.5 to 4.5 VDC	0 to 450 psi
B7	Compressor Discharge Temperature	NTC Thermister (10k@25°C)	-58 to 212°F
B8	Motor Current	0.5 to 4.5 VDC	0 to 125% RLA
B9	Oil Feed Temperature	NTC Thermister (10k@25°C)	-58 to 212°F
B10	Leaving Evaporator Water Temperature	NTC Thermister (10k@25°C)	-58 to 212°F

Table 6, Compressor Controller, Digital Inputs

#	Description	Signal	Signal
ID1	Manual Off	0 VAC (Off)	24 VAC (Auto)
ID2	Mech High Pressure	0 VAC (High Pressure)	24 VAC (OK)
ID3	Motor High Temperature	0 VAC (High Temp)	24 VAC (OK)
ID4	Vanes Closed Switch	0 VAC (Not Closed)	24 VAC (Closed)
ID5	Starter Transition	0 VAC (No Transition)	24 VAC (Transition)
ID6	Starter Fault	0 VAC (Fault)	24 VAC (No Fault)
ID7	Evap Flow	0 VAC (N0 Flow)	24 VAC (Flow)
ID8	Cond Flow	0 VAC (N0 Flow)	24 VAC (Flow)
ID9	Vanes Open Switch	0 VAC (Not Open)	24 VAC (Open)

Table 7, Compressor Controller, Analog Outputs

#	Description	Output Signal	Range
Y1	Compressor VFD Speed	0 to 10 VDC	0 to 100%

Table 8, Compressor Controller, Digital Outputs

#	Description	Load	Output OFF	Output ON
NO1	Motor Control Relay	Starter	Compressor OFF	Compressor ON
NO2	Hot Gas Bypass	Solenoid	No Bypass	Bypass
NO3	Liquid Injection	Solenoid	No Injection	Injection
NO4	Oil Pump	Pump Contactor	Pump OFF	Pump ON
NO5	Oil Sump Heater	Heater	Heater OFF	Heater ON
NO6	Oil Cooler	Solenoid	Cooling OFF	Cooling ON
NO7	Vane Pulse	Solenoid	Hold	Move Vanes
NO/C8	Load/Unload	Solenoid	Unload	Load

Guardister™ Board

The Guardister board monitors the motor winding temperature through embedded Guardistor temperature sensors in the motor. If the motor temperature rises to an unsafe level, the board will signal the compressor controller and the compressor will will shut down.

Signal Converter Board

The AC current signal generated by the starter is converted by the separate signal board into a 0-5 VDC signal that is directly proportional to the compressor motor amp draw. The amp draw signal is sent to the compressor controller.

Transducer Converter Board

The transducer converter board converts the pressure transducer signal to the correct voltage signal and relates it to the compressor controller.

Figure 2, Field Wiring Diagram

MICROTECH CONTROL BOX TERMINALS

(115V) (24V)
UTB1

GND
PE 85
54
POWER
NEUTRAL * NOTE 7
86

* REMOTE ON/OFF (NOTE 5)

330387901

* NOTE 10
80
70
* MODE SWITCH

* COOLING TOWER FOURTH STAGE STARTER
C4
74
55
86
86

* NOTE 8
EP2
NOTE 11
EWI-2
* CHILLED WATER PUMP STARTERS

* COOLING TOWER THIRD STAGE STARTER
C3
79
73

* NOTE 8
EP1
NOTE 11
EWI-1

* COOLING TOWER SECOND STAGE STARTER
C2
78
77
76
75

(NOTE 6) SWITCH DELTA P FLOW OR EVAP.
(NOTE 6) SWITCH DELTA P FLOW OR COND.

* NOTE 9
CP2
NOTE 11
CWI-2

* COOLING TOWER FIRST STAGE STARTER
C1
T3-S
EF
CF

* CONDENSER WATER PUMP STARTERS

COMMON
81
82(NO)
ALARM RELAY (NOTE 4)
83(NC)
* NOTE 4
POWER
84

* NOTE 9
CP1
NOTE 11
CWI-1

COOLING TOWER BYPASS VALUE
52
71
0-10 VDC
COOLING TOWER VFD
71
53
0-10 VDC

MICROTECH COMPRESSOR CONTROL BOX TERMINALS CTB1

L1 L2 L3
-LINE-
NOTE 2
115VAC
GND
PE
CP1
L1
CP2
L2
23(5A)
23
24(5)
24
25
25

COMPRESSOR MOTOR STARTER (NOTE 1)

1 — 1
2 — 2
3 — 3
4 — 4
6 — 11
11 — 11
11 — 12
12 — 12
22 — 22

-LOAD-
NOTE 2
LESS THAN 30V OR 24VAC

-STARTER LOAD SIDE TERMINALS-
VFD
U V W
T1 T6 T2 T4 T3 T5
-COMPRESSOR TERMINALS-

-STARTER LOAD SIDE TERMINALS-
WYE- DELTA
T1 T2 T3 T4 T5 T6
T1 T2 T3 T4 T5 T6
-COMPRESSOR TERMINALS-

-STARTER LOAD SIDE TERMINALS-
SOLID STATE
T1 T2 T3
T1 T6 T2 T4 T3 T5
-COMPRESSOR TERMINALS-

-STARTER LOAD SIDE TERMINALS-
MEDIUM AND HIGH VOLTAGE
T1 T2 T3
T1 T2 T3
-COMPRESSOR TERMINALS-

NOTE 12

FOR DC VOLTAGE AND 4-20 MA CONNECTIONS (SEE NOTE 3)

FOR DETAILS OF CONTROL REFER TO UNIT CONTROL SCHEMATIC 330342101

COMPRESSOR CONTROL SCHEMATIC: 330342201

LEGEND: 330343001

* FIELD SUPPLIED ITEM

NOTES:

1. COMPRESSOR MOTOR STARTERS ARE EITHER FACTORY MOUNTED AND WIRED OR SHIPPED SEPARATE FOR FIELD MOUNTING AND WIRING. IF PROVIDED BY OTHERS STARTERS MUST COMPLY WITH MCQUAY SPECIFICATION 359A999. ALL LINE AND LOAD SIDE POWER CONDUCTORS MUST BE COPPER.

2. IF STARTERS ARE FREE STANDING, THEN FIELD WIRING BETWEEN THE STARTER AND THE CONTROL PANEL IS REQUIRED. MINIMUM WIRE SIZE FOR 115 VAC IS 12 GA. FOR A MAXIMUM LENGTH OF 50 FEET. IF GREATER THAN 50 FEET REFER TO MCQUAY FOR RECOMMENDED WIRE SIZE MINIMUM. WIRE SIZE FOR 24 VAC IS 18 GA. ALL WIRING TO BE INSTALLED AS NEC CLASS 1 WIRING SYSTEM. ALL 24 VAC WIRING MUST BE RUN IN SEPARATE CONDUIT FROM 115 VAC WIRING. MAIN POWER WIRING BETWEEN STARTER AND MOTOR TERMINAL IS FACTORY INSTALLED WHEN UNITS ARE SUPPLIED WITH UNIT MOUNTED STARTERS. WIRING OF FREE STANDING STARTER MUST BE WIRED IN ACCORDANCE WITH NEC AND CONNECTION TO COMPRESSOR MOTOR TERMINALS MUST BE MADE WITH COPPER WIRE AND COPPER LUGS ONLY.

3. FOR OPTIONAL SENSOR WIRING SEE UNIT CONTROL DIAGRAM. IT IS RECOMMENDED THAT DC WIRES BE RUN SEPARATELY FROM 115 VAC WIRING.

4. A CUSTOMER FURNISHED 24 OR 120 VAC POWER FOR ALARM RELAY COIL MAY BE CONNECTED BETWEEN UTB1 TERMINALS 84 POWER AND 81 NEUTRAL OF THE CONTROL PANEL FOR NORMALLY OPEN CONTACTS WIRE BETWEEN 82 & 81. FOR NORMALLY CLOSED WIRE BETWEEN 83 & 81. THE ALARM IS OPERATOR PROGRAMMABLE. MAXIMUM RATING OF THE ALARM RELAY COIL IS 25VA.

5. REMOTE ON/OFF CONTROL OF UNIT CAN BE ACCOMPLISHED BY INSTALLING A SET OF DRY CONTACTS BETWEEN TERMINALS 70 AND 54.

6. EVAPORATOR AND CONDENSER PADDLE TYPE FLOW SWITCHES OR WATER PRESSURE DIFFERENTIAL SWITCHES ARE REQUIRED AND MUST BE WIRED AS SHOWN. IF FIELD SUPPLIED PRESSURE DIFFERENTIAL SWITCHES ARE USED THEN THESE MUST BE INSTALLED ACROSS THE VESSEL AND NOT THE PUMP.

7. CUSTOMER SUPPLIED 115 VAC 20 AMP POWER FOR OPTIONAL EVAP AND COND WATER PUMP CONTROL POWER AND TOWER FANS IS SUPPLIED TO UNIT CONTROL TERMINALS (UTB1) 85 POWER / 86 NEUTRAL, PE EQUIPMENT GROUND.

8. OPTIONAL CUSTOMER SUPPLIED 115 VAC 25 VA MAXIMUM COIL RATED CHILLED WATER PUMP RELAY (EP1 & 2) MAY BE WIRED AS SHOWN. THIS OPTION WILL CYCLE THE CHILLED WATER PUMP IN RESPONSE TO CHILLER DEMAND.

9. THE CONDENSER WATER PUMP MUST CYCLE WITH THE UNIT. A CUSTOMER SUPPLIED 115 VAC 25 VA MAXIMUM COIL RATED CONDENSER WATER PUMP RELAY (CP1 & 2) IS TO BE WIRED AS SHOWN. UNITS WITH FREE COOLING MUST HAVE CONDENSER WATER ABOVE 60^F BEFORE STARTING.

10. OPTIONAL CUSTOMER SUPPLIED 115 VAC 25 VA MAXIMUM COIL RATED COOLING TOWER FAN RELAYS (C1 - C2 STANDARD, C3-C4 OPTIONAL) MAY BE WIRED AS SHOWN. THIS OPTION WILL CYCLE THE COOLING TOWER FANS IN ORDER TO MAINTAIN UNIT HEAD PRESSURE.

11. AUXILIARY 24 VAC RATED CONTACTS IN BOTH THE CHILLED WATER AND CONDENSER WATER PUMP STARTERS SHOULD BE WIRED AS SHOWN.

12. FOR VFD, WYE-DELTA, AND SOLID STATE STARTERS CONNECTED TO SIX (6) TERMINAL MOTORS. THE CONDUCTORS BETWEEN THE STARTER AND MOTOR CARRY PHASE CURRENT AND SELECTION SHALL BE BASED ON 58 PERCENT OF THE MOTOR RATED LOAD AMPERES (RLA). WIRING OF FREE STANDING STARTER MUST BE IN ACCORDANCE WITH THE NEC AND CONNECTION TO THE COMPRESSOR MOTOR TERMINALS SHALL BE MADE WITH COPPER WIRE AND COPPER LUGS ONLY. MAIN POWER WIRING BETWEEN THE STARTER AND MOTOR TERMINALS IS FACTORY INSTALLED WHEN CHILLERS ARE SUPPLIED WITH UNIT MOUNTED STARTERS.
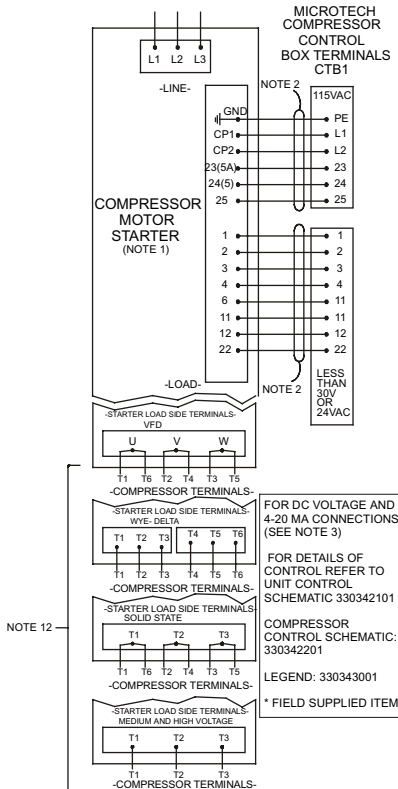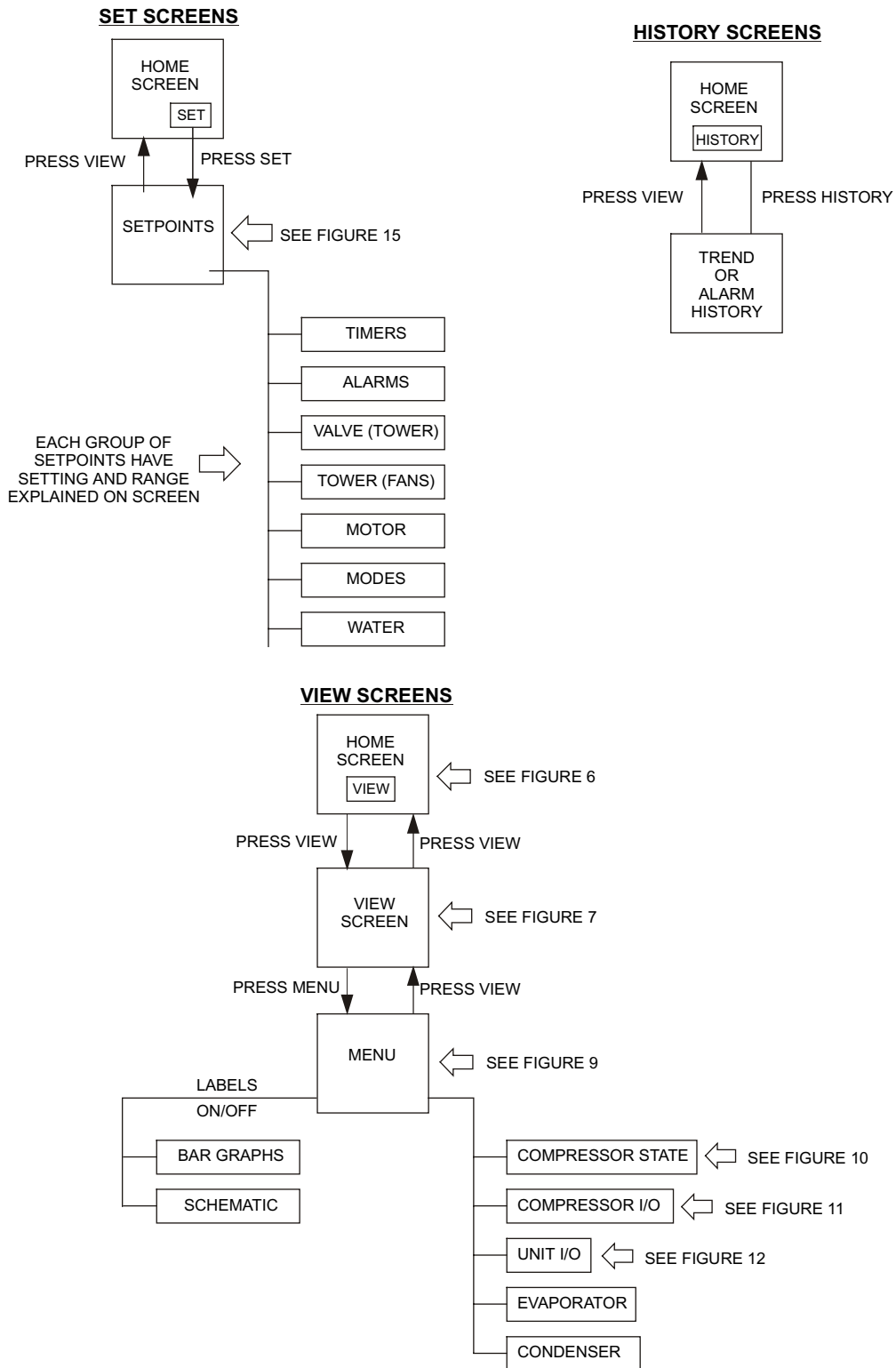
Operator Interface Touch Screen

Navigation

The home screen shown in VIEW screen on page 13 is usually left on (there is a screen-saver built in that is reactivated by touching the screen anywhere). This VIEW screen contains the STOP and AUTO buttons used to start and stop the unit when in Local control. Other groups of screens can be accessed from the Home screen by pressing three buttons on the bottom of the screen; HISTORY, VIEW, SET.

- HISTORY will go to the last history screens viewed and can toggle between the two history screens.

  - Trend History

  - Alarm History

- VIEW will go to the next View screen and other sub-View screens used to look in detail at settings and the operation of the chiller. Pressing View from any other screen will return to the Home screen.

- SET will go to a series of screens used to set setpoints.

The figure on the following page illustrates the arrangement of the various screens available on the OITS. A few minutes practice on an actual OITS should provide an acceptable level of confidence in navigating through the screens.

Figure 3, OTIS Screen Layout

SET SCREENS

```
        ┌──────────┐
        │  HOME    │
        │ SCREEN   │
        │  ┌─────┐ │
        │  │ SET │ │
        │  └─────┘ │
        └──────────┘
   PRESS VIEW  │  PRESS SET
        ↑      ↓
   ┌──────────┐
   │ SETPOINTS│  ⇐ SEE FIGURE 15
   └──────────┘
```

EACH GROUP OF
SETPOINTS HAVE
SETTING AND RANGE   ⇨
EXPLAINED ON SCREEN

- TIMERS
- ALARMS
- VALVE (TOWER)
- TOWER (FANS)
- MOTOR
- MODES
- WATER

HISTORY SCREENS

```
        ┌──────────┐
        │  HOME    │
        │ SCREEN   │
        │ ┌───────┐│
        │ │HISTORY││
        │ └───────┘│
        └──────────┘
  PRESS VIEW │ PRESS HISTORY
        ↑    │
   ┌──────────┐
   │  TREND   │
   │   OR     │
   │  ALARM   │
   │ HISTORY  │
   └──────────┘
```

VIEW SCREENS

```
        ┌──────────┐
        │  HOME    │
        │ SCREEN   │      ⇐ SEE FIGURE 6
        │ ┌──────┐ │
        │ │ VIEW │ │
        │ └──────┘ │
        └──────────┘
  PRESS VIEW │   ↑ PRESS VIEW
        ↓    │
   ┌──────────┐
   │  VIEW    │   ⇐ SEE FIGURE 7
   │ SCREEN   │
   └──────────┘
  PRESS MENU │   ↑ PRESS VIEW
        ↓    │
   ┌──────────┐
   │  MENU    │   ⇐ SEE FIGURE 9
   └──────────┘
```

LABELS
ON/OFF
- BAR GRAPHS
- SCHEMATIC

- COMPRESSOR STATE ⇐ SEE FIGURE 10
- COMPRESSOR I/O ⇐ SEE FIGURE 11
- UNIT I/O ⇐ SEE FIGURE 12
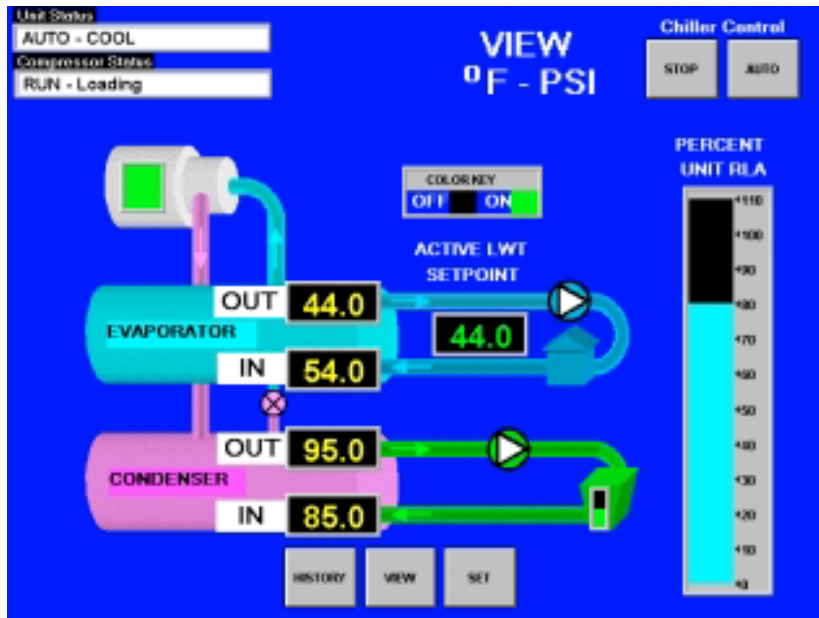- EVAPORATOR
- CONDENSER

Pressing VIEW from any sub-menu will toggle back to the home screen.
Pressing MENU when in any sub-menu will return to the view screen.
Pressing SET or HISTORY will go to these groups of menus.

Screen Descriptions

VIEW Screens

View screens are used for looking at unit status and conditions.

Figure 4, **Home View Screen**

Home View Screen

The Home View Screen shows the basic condition of the chiller and is the screen that is normally left on. Dual compressor units will show two compressors and the status of both. The pressures and temperatures shown are common to the unit and correct for both single and dual compressor chillers. Superimposed on a chiller schematic is:

Information

Chilled water (Active) setpoint

- Entering and leaving chilled water temperatures

- Entering and leaving condenser water temperatures

- Percent motor amps

- UNIT STATUS is MODE followed by STATE followed by the SOURCE that is the device or signal that created the STATE. The possible combinations are in the following table:

Table 9, UNIT STATUS Combinations

MODE	STATE	SOURCE
COOL	OFF	Manual Switch
ICE	SHUTDOWN (Note 1)	Remote Switch
HEAT	AUTO	Local
		BAS Network

Notes
1. Shutdown is the state of shutting down; vane close, postlube, etc

- COMPRESSOR STATUS is MODE followed by STATE followed by the SOURCE that is the device or signal that created the STATE. The possible combinations are in the following table

Table 10, COMPRESSOR STATUS Possibilities

Complete STATUS Text (in priority sequence)	Notes
OFF Manual Switch	
OFF Compressor Alarm	
OFF Unit State	
OFF Evap Flow/Re-circulate	
OFF Low Oil Sump Temp	Reason for the compressor being off.
OFF Start to Start Timer=xxx	
OFF Stop to Start Timer=xxx	
OFF Staging (Next ON)	
OFF Awaiting Load	
PRELUBE Vanes Open	
PRELUBE Timer=xxx	Current state of the Prelube sequence
PRELUBE Condenser Flow	
RUN Unload Vanes-Max Amps	Overrides water temperature command
RUN Hold Vanes-Max Amps	
RUN Manual Vanes & Speed	
RUN Load Vanes-Manual Speed	
RUN Hold Vanes-Manual Speed	Used for service purposes. "T" password required. Operated from compressor controller
RUN Unload Vanes-Manual Speed	
RUN Load Speed-Manual Vanes	
RUN Hold Speed-Manual Vanes	
RUN Unload Speed-Manual Vanes	
RUN Unload Vanes-Lag Start	
RUN Hold Vanes-Evap Press	
RUN Unload Vanes-Evap Press	
RUN Unload Vanes-Soft Load	
RUN Hold Vanes-Soft Load	Overrides water temperature command
RUN Load Vanes-Disch Temp	
RUN Hold Vanes-Pull-down Rate	
RUN Unload Vanes-Demand Limit	
RUN Hold Vanes-Min Amps	
RUN Load Vanes	
RUN Hold Vanes	Normal operation
RUN Unload Vanes	
SHUTDOWN Unload	Unloading during the shutdown sequence
POSTLUBE Timer=xxx	Postlube timer on
POSTLUBE Motor Current High	Compressor motor running during the shutdown mode. It should be off.

NOTES

1) Timer countdown values will be shown where "(xxx)" is shown below

2) For a VFD equipped compressor, "Vanes" or "Speed" is shown in the RUN state to indicate if the capacity is controlled by speed from the VFD or by vane control

3) When the compressor is in the START state (oil pump started but still waiting for oil pressure), "PRELUBE – Vanes Open" or "PRELUBE – Timer=(xxx)" is shown as appropriate.

Action Buttons for:

- Chiller Control: normal start (AUTO button) and STOP button. The STOP button activates the normal shutdown sequence. These buttons are only active when the when control is in the "Local Control" mode only. This eliminates the possibility of inadvertently shutting off the unit locally when it is under control of a remote signal such as a BAS.

- HISTORY, toggles between the Trend History screen and the Alarm History screen.

- SET, toggles between the Set Points screen that are used for changing setpoints and the Service screen.

Returning

Pressing the VIEW button from any screen will return to this screen

Figure 5, Detail View Screen

Pressing the VIEW button on the bottom of the Home View screen accesses the Detail View Screen shown above. This screen gives additional information on the refrigerant pressures and temperatures. The COLOR KEY in the upper right corner shows that the yellow numbers are temperatures and the white numbers are pressure values. In addition to the data displayed:

NOTE: the screen shown above is for a dual compressor unit

Pressing the STATE button will bring up a display of the compressor state as described in Figure 8 on page 17.

Pressing the I/O button displays the status of the compressor inputs and outputs as described in Figure 9 on the same page. Dual compressor units will have a COMP button that will toggle between the two compressors' data, allowing the STATE and I/O detail screens to be viewed for either compressor.

Pressing the UNIT I/O button displays the unit inputs and outputs as described in Figure 10 on page 18.

Pressing the EVAP or COND button will give detailed information on the evaporator or condenser pressures and temperatures.

Pressing the LW SPs button will show a window from which the leaving water setpoints can be changed. However, it is recommended that the SETPOINT screens described later be used for this purpose.

Pressing the MENU button on the bottom of the screen will go to a menu (see Figure 7) from which the above listed screens can also be accessed. The MENU button is merely another way of getting to the detail screens.

*Figure 6, Detail View Screen with Labels Attached*
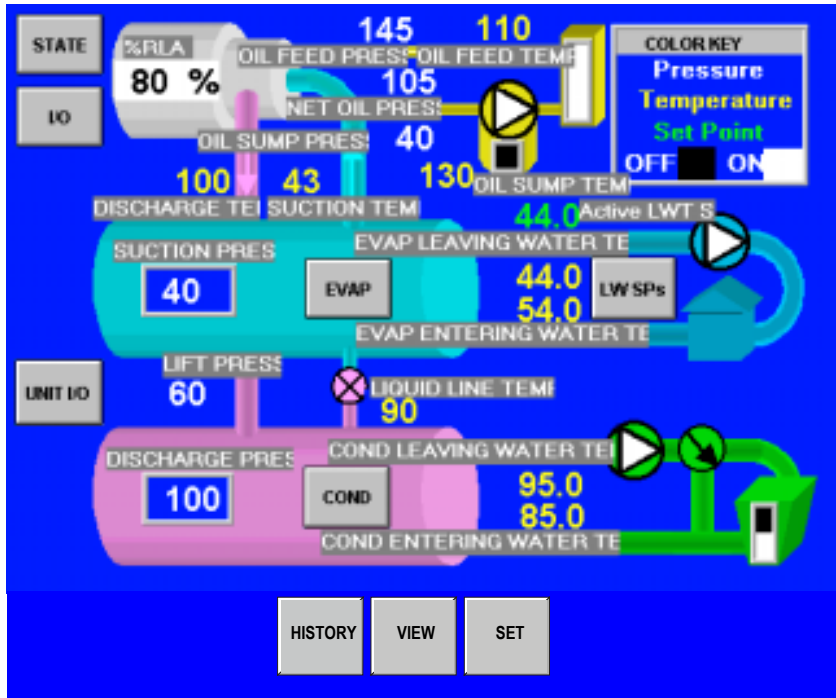
Detail View Screen with Labels adds descriptive labels to the normal detail view screen to explain exactly what the numbers shown represent. The method for adding or deleting the labels is explained in Figure 7. Once the operator is familiar with what the temperatures and pressures represent, there is little need for the labels.

Figure 7, View Menu

This View Menu is accessed by pressing the MENU button from the Detail View Screen. The menu screen has two functions:

1. It turns the labels shown on Detail View Screen (Figure 6) on and off. Pressing the SCHM-L button adds the labels if they are not present and SCHM removes them if they are present. A screen with unit temperatures and pressures is shown on a BAR SCREEN (see Figure 11 on page 18). This screen is accessed by pressing BARS or BARS-L if the temperature and pressure graph labels are desired.

2. There is more data available to view and it is accessed through the buttons on the right of the screen. It is segregated by general topics that are self-explanatory. These buttons are also repeated on the Detail View Screen as previously noted.
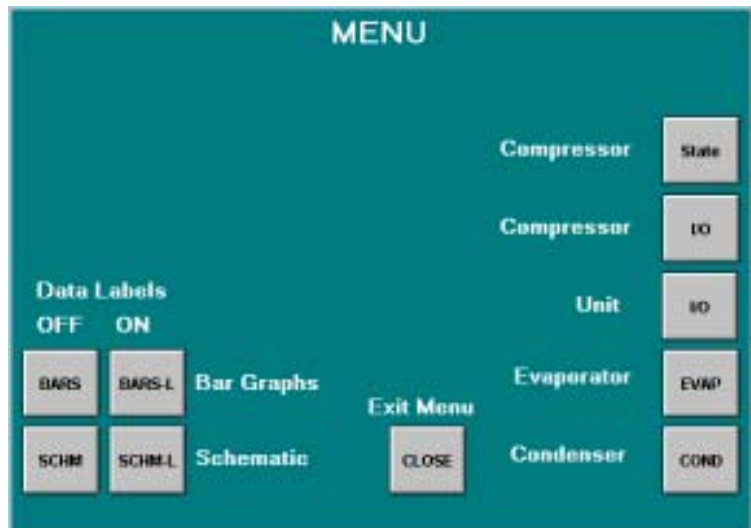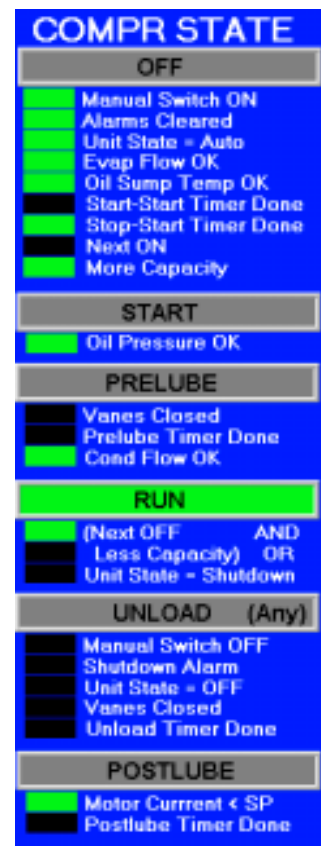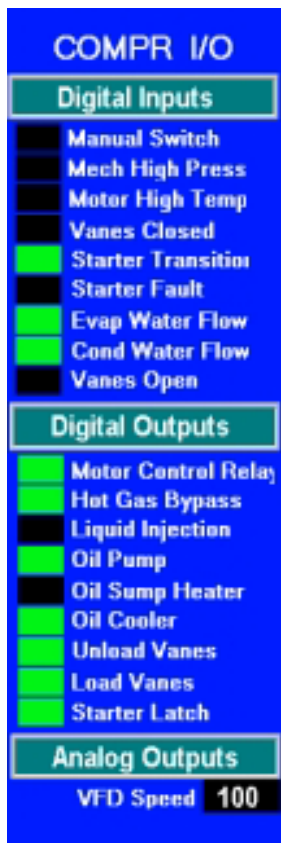
Figure 8, View Compressor State Screen

For example, pressing the Compressor-State button will yield the following screen superimposed on the right side of the Detail View Screen. The Compressor State screen is basically a compilation of the events that the chiller sequences through at startup. A green light (light gray in the figure) indicates that a particular sequence requirement has been satisfied. It is recommended that this screen be viewed during the start up sequence. One can see the requirements light up as they are met and quickly see why a non-start may have occurred. For example, The Evap Flow OK will light when the evaporator flow switch is closed by flow, Oil Sump Temp OK will light if (or when) the oil temperature is above the Startup Temperature Setpoint, both timers must be timed out, Oil Pressure OK will light when sufficient oil pressure is achieved, etc.

The bottom three sections (from "RUN" down) are in effect during the shut down process. The compressor is officially off when the Postlube Timer is Done. The sequence transitions back to OFF at this point and the OFF light will be illuminated.


Figure 9, View Compressor Input/Output Status

Pressing the Compressor I/O button on the VIEW MENU screen will access the screen shown to the right in Figure 9. It is superimposed on the right side of the Detail View Screen. It gives the status of the *compressor* digital inputs and analog and digital outputs. Many of these I/Os also appear in the Compressor State screen since they are part of the start up sequence and define the compressor state at any given time. Dual compressor units will have two of any compressor screen.

A COMP button will appear in the lower left-hand corner of the Detail View Screen (Figure 5 on page 15) on dual compressor WDC units. This button will toggle compressor data from #1 compressor to #2 compressor.

Figure 10, Unit Input/Output Screen
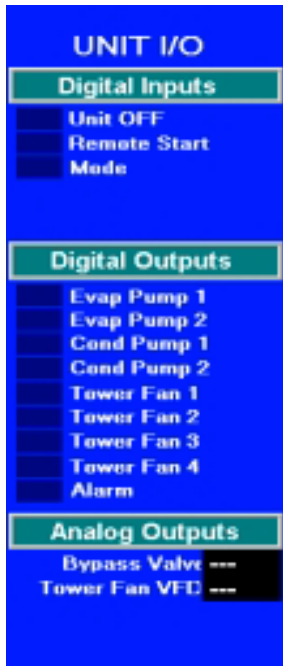
The screen shown to the left gives the status of the *unit* controller digital inputs and outputs and analog outputs. The unit controller in concerned with the operation of the entire unit and its I/Os reflect this. Note that proof of water flow, operation of condenser and evaporator water pumps and tower operation constitute most of the data flow. An illuminated block (gray in the figure) indicated that either an input or output signal exists

Pressing the Evaporator or Condenser buttons on Detail View Screen will display pertinent vessel temperatures and pressures. The screens are very simple, self-explanatory, and not shown here.

Figure 11, Bars Chart with Labels "ON" & LEAVING WATER SETPOINT

The bar chart screen is accessed from the MENU screen (Figure 7) by selecting Bar Graphs\BARS-L for the charts with labels attached as shown above or Bar Graphs\BARS for charts without labels.
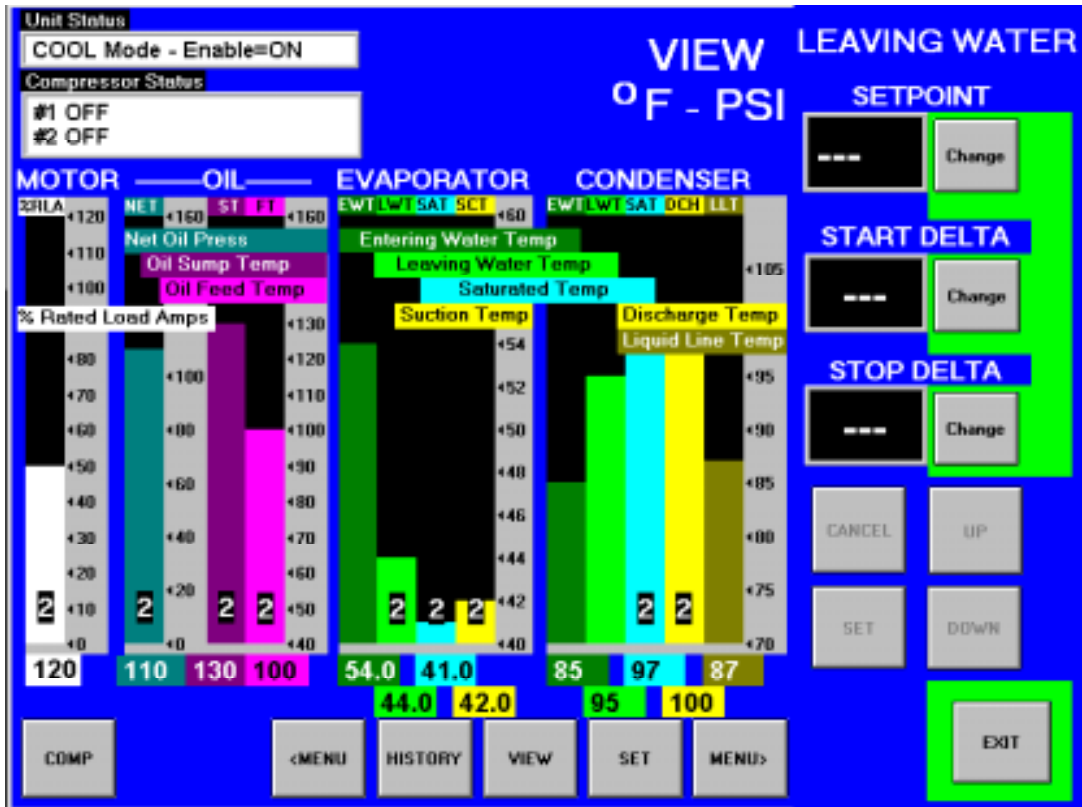
SET Screens

The set screens on the Interface Panel are used to input the many setpoints associated with equipment of this type. MicroTech II provides an extremely simple method for accomplishing this. (NOTE: If the Interface Panel is unavailable, the unit controller can be used to change setpoints.) Appropriate setpoints are factory set and checked by McQuayService or Factory Authorized Service Company during commissioning. However, adjustments and changes are often required to meet job conditions. Certain settings involving pumps and tower operation are field set.

Pressing the SET button found on almost every screen accesses the last SET screen used or the SERVICE screen, whichever of the two was used last.

When in any SET screen, pressing the SET button again will toggle to the SERVICE screen shown on page 31.

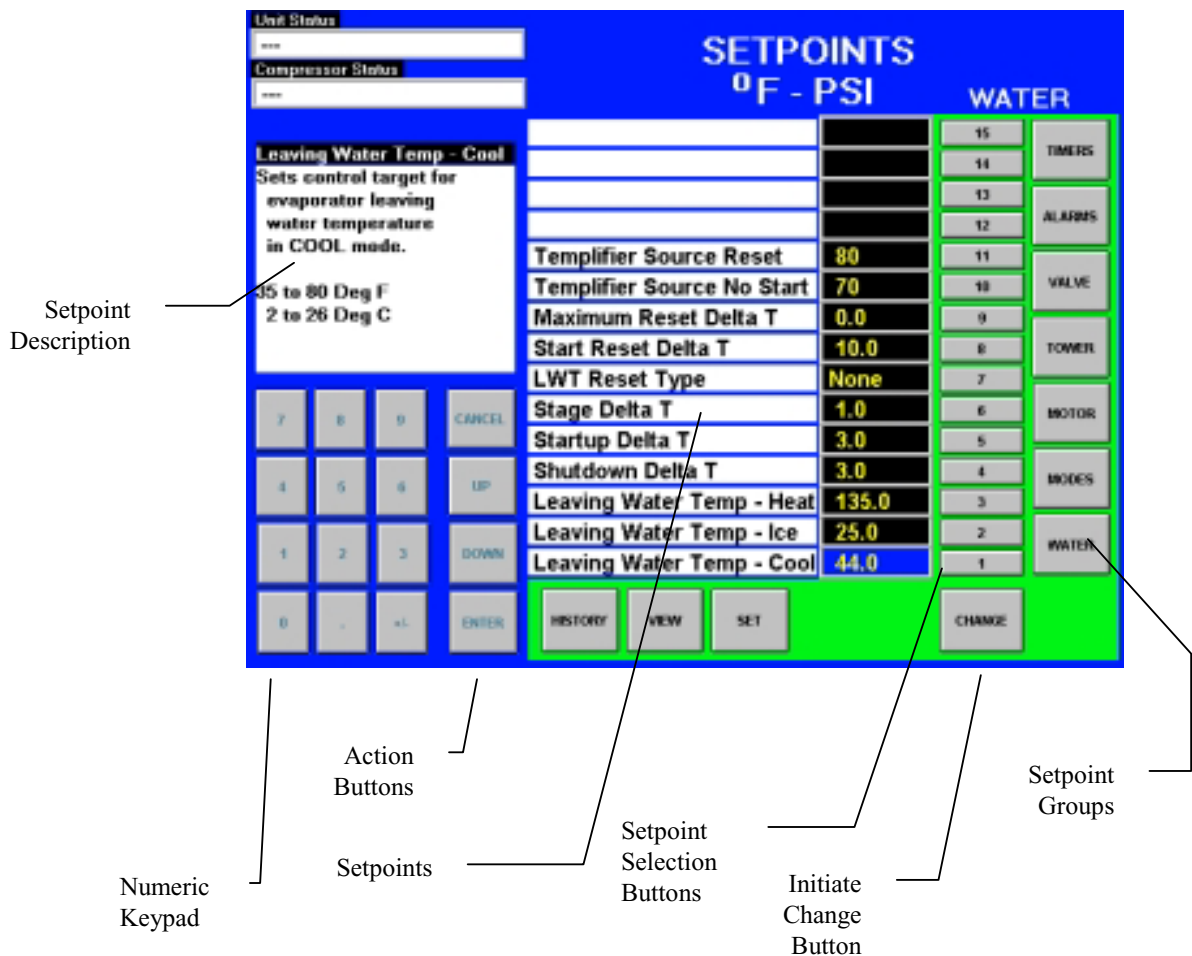*Figure 12, A Typical SETPOINT Screen*

Figure 12 shows the SETPOINT screen with WATER setpoints selected. The various setpoint groups are in a column on the right side of the screen. Each button contains a number of setpoints grouped together by similar content. The WATER button (as shown) contains various setpoints relating to water temperatures.

NOTE: Some setpoints that do not apply to a particular application may still be listed on the screen. They will be inactive and can be ignored. For example, of setpoints 1, 2, and 3 above, only one will be active depending on the unit mode selected in the MODE setpoints.

The numbered buttons in the second from right column are pressed to select a particular setpoint. The selected setpoint will appear in blue on the screen and a description of it (with the range of available settings) will appear in the upper left-hand box.

Procedure for Changing a Setpoint

A list of setpoints, their default value, their available setting range, and password authority are in Table 21 on page 48 for the unit and Table 22 on page 56 for the compressor..

1. Press the applicable Setpoint Group button (Figure 12). A complete explanation of setpoint content of each group follows this section.

2. Select the desired setpoint by pressing the numbered button.

3. Press the CHANGE button indicating that you wish to change a setpoint value. The KEYBOARD screen will be turned on automatically for entering the password.

   - O = Operator level password is <u>100</u>

   - M = Manager level password

   - T = Technician level password

4. Press the appropriate numbers in the numeric keyboard to enter the password. There is a small delay between pressing the keypad and recording the entry. Be sure that an asterisk appears in the window before pressing the next number. Press ENTER to return to the SETPOINT screen. The password will remain open for 15 minute after initiation and does not to be re-entered.

5. Press CHANGE again. The right side of the screen will turn blue (inactive).

6. The numeric keypad and action buttons in the lower left-hand corner of the screen will be activated (the background will turn green). Setpoints with numeric values can be changed in two ways:

   - Select the desired value by pressing the numbered buttons. Press ENTER to enter the value or CANCEL to cancel the transaction.

   - Press the UP or DOWN button to increase or decrease the value displayed. Press ENTER to enter the value or CANCEL to cancel the transaction.

   Some setpoints are text rather than numeric values. For example, LWT Reset Type can be "None" or "4-20 ma". The selection can be made by toggling between choices using the UP or Down button. If dashed lines appear in the setpoint window, it indicates that you have toggled too far and need to reverse direction. Press ENTER to enter the choice or CANCEL to cancel the transaction.

   Once CHANGE is selected, the CANCEL or ENTER buttons must be pressed before another setpoint can be selected.

7. Additional setpoints can be changed by selecting another setpoint on the screen or by selecting an entirely new group of setpoints.

Explanation of Setpoints

Each of the seven setpoint group of screens are detailed in the following section. In many cases the setpoint content is obvious and no explanation is included.

1. TIMERS, for setting timers such as start-to-start, prelube, postlube, etc.

2. ALARMS, for setting the limit and shutdown alarms.

3. VALVE, sets the parameters for operation of an optional field installed tower bypass valve.

4. TOWER, selects the method of controlling the cooling tower and sets the parameters for fan staging/VFD.

5. MOTOR, selects motor related setpoints such as amp limits, VFD settings, etc. Also has maximum and minimum rate of change of chilled water temperature.

6. MODES, selects various modes of operation such as control source, multiple compressor staging, pump staging, BAS protocol, etc.

7. WATER, leaving water temperature setpoint, start and stop delta-T, resets, etc.
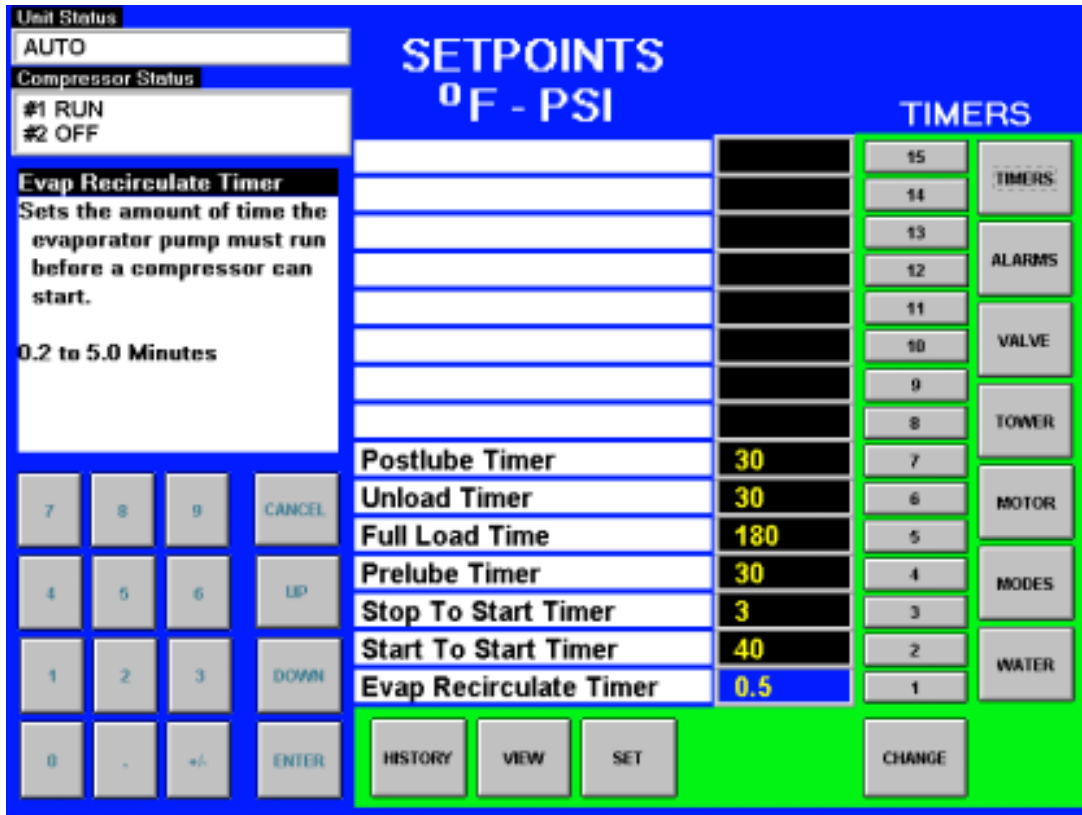
TIMERS Setpoint

Figure 13, TIMERS Setpoint Screen

Table 11, TIMER Setpoints

Description	No.	Default	Range	Pass-word	Comments
Postlube Timer	7	30 sec	10 to 240 sec	T	Time for postlube before compressor can stop
Unload Timer	6	30 sec	10 to 240 sec	T	Time compressor will unload before going to postlube
Full Load Timer	5				Time compressor must load for full open vanes
Prelube Timer	4	30 sec	10 to 240 sec	T	Time compressor must prelube before starting
Stop-Start	3	3 min	3 to 20 min	M	Time from when compressor stops to when it can restart
Start-Start	2	40 min	15 to 60 min	M	Time from when compressor starts to when it can start again
Evap Recirculate	1	30 sec	15 sec to 5 min	M	Time that evaporator pump must run before compressor start

ALARMS Setpoint

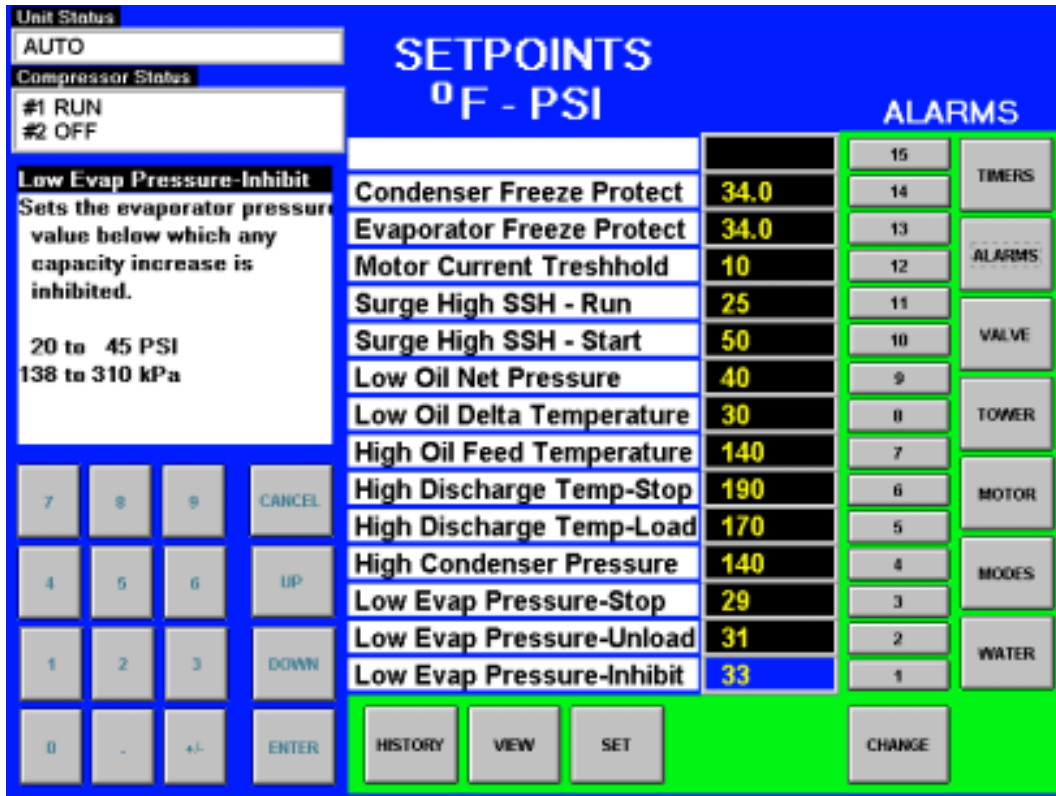*Figure 14, ALARMS Setpoint Screen*

Table 12, ALARM Setpoints

Description	No.	Default	Range	Pass-word	Comments
Condenser Freeze	14	34.0 °F	-9.0 to 45.0 °F	T	Minimum cond. sat. temp. to start pump
Evaporator Freeze	13	34.0 °F	-9.0 to 45.0 °F	T	Minimum evap. sat. temp. to start pump
Motor Current Threshold	12	10%	1 to 20%	T	Min %RLA to consider motor off
Surge High Suction SH-Run	11	25 °F	5 to 45 °F	T	Max SSH to shut down compressor after 5 min run time
Surge High Suction SH-Start	10	50 °F	25 to 90 °F	T	Max SSH to shut down compressor during first 5 min run time
Low Net Oil Pressure	9	40 psi	30 to 60 psi	T	Min net pressure (feed minus sump)
Low Oil Delta Temperature	8	30 °F	20 to 80 °F	T	Min Delta-T (sat evap minus oil temp)
High Oil Feed Temperature	7	140 °F	120 to 240 °F	T	Max oil temperature
High Discharge Temp-Shutdown	6	190 °F	120 to 240 °F	T	Max discharge gas temp, stop compressor
High Discharge Temp-Load	5	170 °F	120 to 240 °F	T	Max discharge gas temp – load comp
High Condenser Pressure	4	140 psi	120 to 240 psi	T	Max discharge pressure, stop compressor
Low Evap Pressure, Stop	3	26 psi	10 to 45 psi	T	Min evap pressure – stop compressor
Low Evap Pressure-Unload	2	31 psi	20 to 45 psi	T	Min evap pressure – unload compressor
Low Evap Pressure-Inhibit	1	38 psi	20 to 45 psi	T	Min evap pressure – inhibit loading

Cooling Tower Bypass VALVE Settings

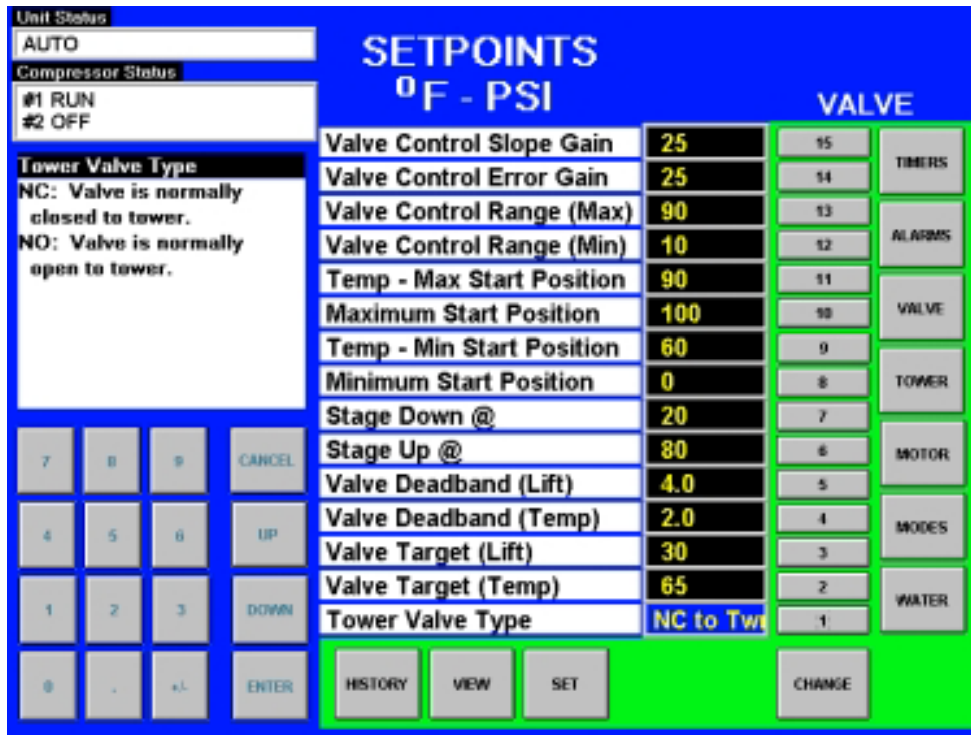*Figure 15, Tower Bypass VALVE Setpoint Screen*

Table 13, Tower Bypass VALVE Setpoints (See page 25 for complete explanation.)

Description	No.	Default	Range	Pass-word	Comments
Slope Gain	15	25	10 to 99	M	Control gain for temperature (or lift) slope
Error Gain	14	25	10 to 99	M	Control gain for temperature (or lift) error
Valve Control Range(Max)	13	90%	0 to 100%	M	Maximum valve position, overrides all other settings
Valve Control Range (Min)	12	10%	0 to 100%	M	Minimum valve position, overrides all other settings
Temp - Maximum Position	11	90 °F	0 to 100 °F	M	Condenser EWT at which valve should be open to tower
Maximum Start Position	10	100%	0 to 100%	M	Initial valve position when condenser EWT is at or above Setpoint # 9
Temp - Minimum Position	9	60 °F	0 to 100 °F	M	Condenser EWT at which initial valve position is set to Setpoint # 6
Minimum Start Position	8	0%	0 to 100%	M	Initial position of valve when condenser EWT is at or below Setpoint # 7
Stage Down @	7	20%	0 to 100%	M	Valve position below which the fans can stage down (Tower Setpoint #2 = Valve Stage Down VFD speed below which the next fan speed can turn off (Tower Setpoint # 2 = valve/VFD ????
Stage Up @	6	80%	0 to 100%	M	Valve position above which the fans can stage up (Tower Setpoint #2 = Valve Stage Down VFD speed above which the next fan speed can turn on (Tower Setpoint # 2 = valve/VFD ????
Valve Deadband (Lift)	5	4.0 psi	1.0 to 20.0 psi	M	Control deadband, Tower Setpoint #1=Lift
Valve Deadband (Temp)	4	2.0 °F	1.0 to 10.0 °F	M	Control deadband, Tower Setpoint #1=Temp
Valve Target (Lift)	3	30 psi	10 to 130 psi	M	Target for lift pressure (Tower Setpoint #1= Lift), Works with Setpoint # 5
Valve Setpoint (Temp)	2	65 °F	40 to 120 °F	M	Target for condenser EWT (Tower Setpoint #1= Temp), Works with Setpoint # 4
Valve Type	1	NC (To Tower)	NC, NO	M	Normally closed or normal open to tower

Cooling TOWER Fan Settings

Figure 16, Cooling TOWER Fan Setpoint Screen (See page 25 for complete explanation.)
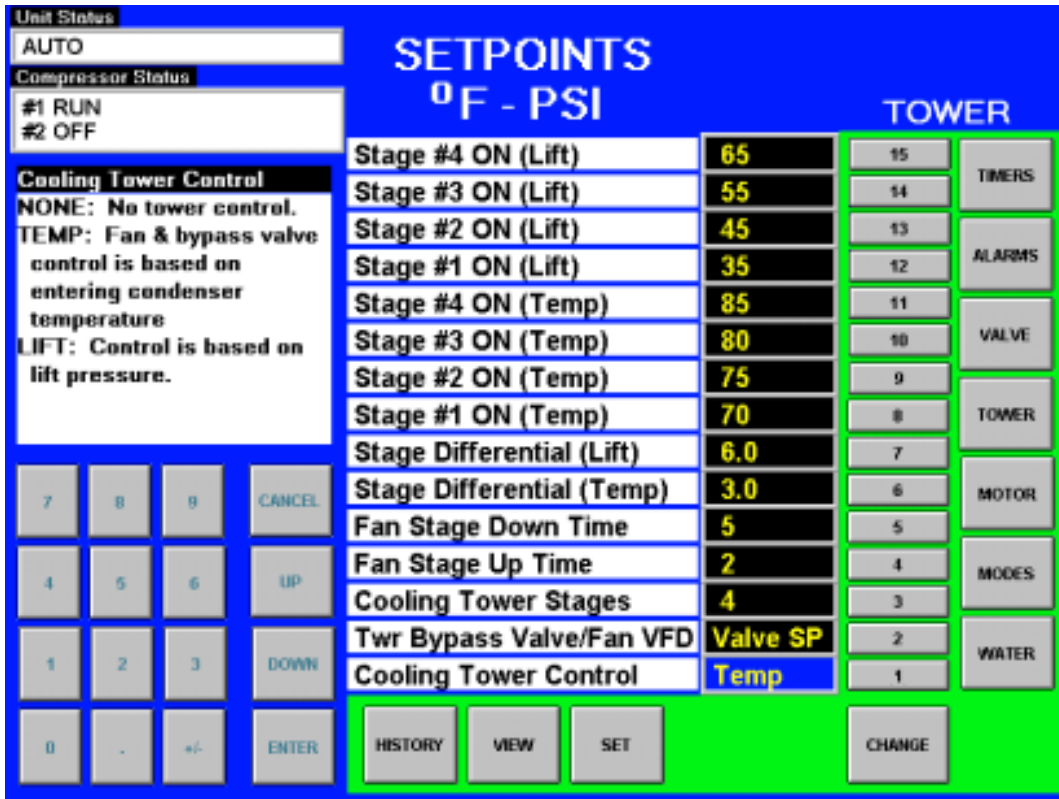

Table 14, Tower Fan Settings

Description	No.	Default	Range	Pass-word	Comments
Stage #4 On (Lift)	15	35 psi	10 to 130 psi	M	Lift pressure for fan stage #1 on
Stage #3 On (Lift)	14	45 psi	10 to 130 psi	M	Lift pressure for fan stage #2 on
Stage #2 On (Lift)	13	55 psi	10 to 130 psi	M	Lift pressure for fan stage #3 on
Stage #1 On (Lift)	12	65 psi	10 to 130 psi	M	Lift pressure for fan stage #4 on
Stage #4 On (Temp)	11	70 °F	40 to 120 °F	M	Temperature for fan stage #1 on
Stage #3 On (Temp)	10	75 °F	40 to 120 °F	M	Temperature for fan stage #2 on
Stage #2 On (Temp)	9	80 °F	40 to 120 °F	M	Temperature for fan stage #3 on
Stage #1 On (Temp)	8	85 °F	40 to 120 °F	M	Temperature for fan stage #4 on
Stage Differential (Lift)	7	6.0 psi	1.0 to 20.0 psi	M	Fan staging deadband with Setpoint # 1=Lift
Stage Differential (Temp)	6	3.0 °F	1.0 to 10.0 °F	M	Fan staging deadband with Setpoint #1=Temp
Stage Down Time	5	5 min	1 to 60 min	M	Time delay between stage up/down event and next stage down
Stage Up Time	4	2 min	1 to 60 min	M	Time delay between stage up/down event and next stage up
Tower Stages	3	2	1 to 4	M	Number of fan stages used
Valve/VFD Control	2	None	None, Valve Setpoint, Valve Stage, VFD Stage, Valve SP/VFD Stage	M	None: No tower valve or VFD Valve Setpoint: Valve controls to VALVE SP3(4) & 5(6) Valve Stage: Valve control setpoint changes to fan stage setpoint VFD Stage: 1st fan is VFD controlled, no valve Valve Setpoint/VFD Stage: Both valve and VFD
Tower Control	1	None	None, Temperature, Lift	M	None: No tower fan control Temperature: Fan and valve controlled by EWT Lift: Fan and valve controlled by lift pressure

Explaination of Tower Control Settings

MicroTech II control can control cooling tower fan stages, a tower bypass valve, and or a tower fan VFD if the chiller has a dedicated cooling tower.

The Tower Bypass Valve position will always control the Tower Fan Staging if Valve Setpoint, Stage Setpoint, or lift is selected. Fan staging is determined by Min & Max Tower Valve Position.

There are five possible tower control strategies as noted below and explained in detail later in this section. They are selected from SETPOINT TOWER SP2.

1. <u>NONE,</u> Tower fan staging only. In this mode the tower fan staging (up to 4 stages) is controlled by either the condenser Entering Water Temperature (EWT) or LIFT temperature (difference between the condenser and evaporator saturated temperatures). Tower bypass or fan speed are not controlled.

2. <u>VALVE SP</u>, Tower staging with low-limit controlled bypass valve. In this mode the tower fans are controlled as in #1 plus a tower bypass valve is controlled to provide a minimum condenser EWT. There is no interconnection between the fan control and the valve control.

3. <u>VALVE STAGE</u>, Tower staging with stage controlled bypass valve. In this mode the bypass valve controls between fan stages to smooth the control and reduce fan cycling

4. <u>VFD STAGE.</u> In this mode a VFD controls the first fan. Up to 3 more fans are staged on and off and there is no bypass valve.

5. <u>VALVE/VFD</u>, Tower fan control with VFD plus bypass valve control.

1. Tower Fan Staging Only (NONE)

The following settings are used for the Tower Fan Staging Only mode, (SP= setpoint)

1) <u>TOWER SETPOINT Screen</u>

   a) SP1. Select TEMP if control is based on condenser EWT or LIFT if based on compressor lift expressed in degrees.

   b) SP2. Select NONE for no bypass valve or fan VFD control.

   c) SP3. Select one to four fan outputs depending on the number of fan stages to be used. More than one fan can be used per stage through the use of relays.

   d) SP4. Select STAGE UP TIME from 1 to 60 minutes. The default value of 2 minutes is probably a good starting point. The value may need to be adjusted later depending on actual system operation.

   e) SP5. Select STAGE DOWN TIME from 1 to 60 minutes. The default value of 5 minutes is probably a good starting point. The value may need to be adjusted later depending on actual system operation.

   f) If TEMP is selected in SP1, use

      i) SP6. Select STAGE DIFFERENTIAL in degrees F, start with default of 3 degrees F.

      ii) SP8-11. Set the STAGE ON temperatures consistent with the temperature range over which the condenser EWT is desired to operate. The default values of 70°F, 75°F, 80°F and 85°F are a good place to start in climates with moderate wet bulb temperatures. The number of STAGE ON setpoints used must be the same as SP3.

   g) If LIFT is selected in SP1, use

      i) SP7. Select STAGE DIFFERENTIAL in PSI. Start with default of 6 PSI.

      ii) SP12-15. Start with default setpoints. The number of STAGE ON setpoints used must be the same as SP3.

See Figure 2, Field Wiring Diagram on page 10 for fan staging field wiring connection points.

2. Tower Fan Staging With Bypass Valve Controlling Minimum EWT (VALVE SP)

1) TOWER SETPOINT Screen

    a) SP1. Select TEMP if control is based on condenser EWT or LIFT if based on compressor lift expressed in degrees.

    b) SP2. Select Valve SP for control of bypass valve based on temperature or lift.

    c) SP3. Select one to four fan outputs depending on the number of fan stages to be used. More than one fan can be used per stage through the use of relays.

    d) SP4. Select STAGE UP TIME from 1 to 60 minutes. The default value of 2 minutes is probably a good starting point. The value may need to be adjusted later depending on actual system operation.

    e) SP5. Select STAGE DOWN TIME from 1 to 60 minutes. The default value of 5 minutes is probably a good starting point. The value may need to be adjusted later depending on actual system operation.

    f) If TEMP is selected in SP1, use

        i) SP6. Select STAGE DIFFERENTIAL in degrees F, start with default of 3 degrees F.

        ii) SP8-11. Set the STAGE ON temperatures consistent with the temperature range over which the condenser EWT is desired to operate. The default values of 70°F, 75°F, 80°F and 85°F are a good place to start in climates with moderate wet bulb temperatures. The number of STAGE ON setpoints used must be the same as SP3.

    g) If LIFT is selected in SP1, use

        i) SP7. Select STAGE DIFFERENTIAL in PSI. Start with default of 6 PSI.

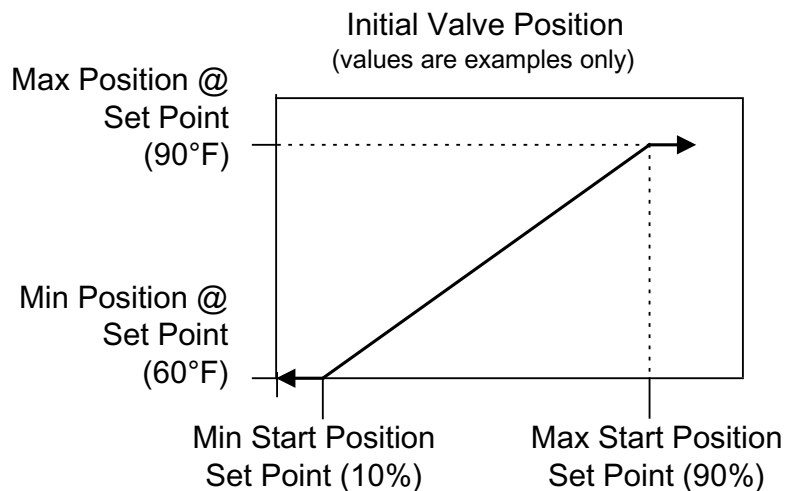   ii) SP12-15. Start with default setpoints. The number of STAGE ON setpoints used must be the same as SP3.

2) VALVE SETPOINT Screen

    a) SP1, Select NC or NO depending if valve is closed to tower with no control power or open to tower with no control power.

    b) If TEMP was selected for fan control above, use

        i) SP2, Set the VALVE TARGET (setpoint), usually 5 degrees below the minimum fan stage setpoint established in TOWER SP11. This keeps full flow through the tower until the last fan is staged off.

        ii) SP4, Set VALVE DEADBAND, the default of 2 degrees F is a good place to start.

        iii) SP6, Set the valve position (% open) above which the first fan can stage on (the fan stage ON temperature and STAGE UP TIMER must also be satisfied). Default is 80%.

        iv) SP7, Set the valve position (% closed) below which the first fan can stage off (the fan stage temperature and STAGE DOWN TIMER must also be satisfied). Default is 20%.

        v) SP8, Set MINIMUM VALVE POSITION when EWT is at or below SP7. Default is 0%.

        vi) SP9, Set the EWT at which the valve position is set to allow the fans to stage up (SP6). Default is 60°F.

        vii) SP10, Set the initial valve position when EWT is at or above SP9. Default is 100%.

        viii) SP11, Set the EWT at which initial valve position is set to SP8. Default is 90°F.

        ix) SP12, Set the minimum position to which the valve can go. Default is 10%.

        x) SP13, Set the maximum position to which the valve can go. Default is 90%.

        xi) SP14, Set the control gain for error. Default is 25.

        xii) SP15, Set the control gain for slope. Default is 25.

NOTE: Setpoints 14 and 15 are site specific dealing with system fluid mass, component size and other factors affecting the reaction of the system to control inputs. These setpoints should be set by personnel experienced with setting up this type of control.

c) If LIFT was selected for fan control, use

   i) SP3, Set the VALVE TARGET (setpoint), usually 30 psi below the minimum fan stage setpoint established in TOWER SP15. This keeps full flow through the tower until the last fan is staged off.

   ii) SP5, Set VALVE DEADBAND, the default of 4 psi is a good place to start.

   iii) SP6, Set the valve position (% open) above which the first fan can stage on (the fan stage ON temperature and STAGE UP TIMER must also be satisfied). Default is 80%.

   iv) SP7, Set the valve position (% closed) below which the first fan can stage off (the fan stage temperature and STAGE DOWN TIMER must also be satisfied). Default is 20%.

   v) SP12, Set the minimum position to which the valve can go. Default is 10%.

   vi) SP13, Set the maximum position to which the valve can go. Default is 90%.

   vii) SP14, Set the control gain for error. Default is 25.

   viii) SP15, Set the control gain for slope. Default is 25.

NOTE: Setpoints 14 and 15 are site specific dealing with system fluid mass, component size and other factors affecting the reaction of the system to control inputs. These setpoints should be set by personnel experienced with setting up this type of control.

Initial Valve Position
(values are examples only)

Max Position @ Set Point (90°F)

Min Position @ Set Point (60°F)

Min Start Position Set Point (10%)

Max Start Position Set Point (90%)

See Figure 2 on page 10 for fan staging and bypass valve field wiring connection points.

3. Tower staging with bypass valve controlled by fan stage (VALVE STAGE)

This mode is similar to #2 above except that the bypass valve setpoint changes to be set at the same point of whatever fan stage is active rather than just maintaining a single minimum condenser EWT. In this mode the valve controls between fan stages and tries to maintain the fan stage setting in effect. When it is max open or max closed (staging up or down) and the temperature (or lift) moves to the next fan stage, the valve will go the opposite max setting. This mode reduces fan cycling.

This mode is programmed the same as Mode #2 above except that in SETPOINT, TOWER, SP2, VALVE STAGE is selected instead of VALVE SP.

4. Fan VFD, no bypass valve (VFD STAGE)

The fan VFD mode assumes that the tower is driven by one large fan. Set up is as above except in SETPOINT, TOWER, SP2, VALVE/VFD is selected.
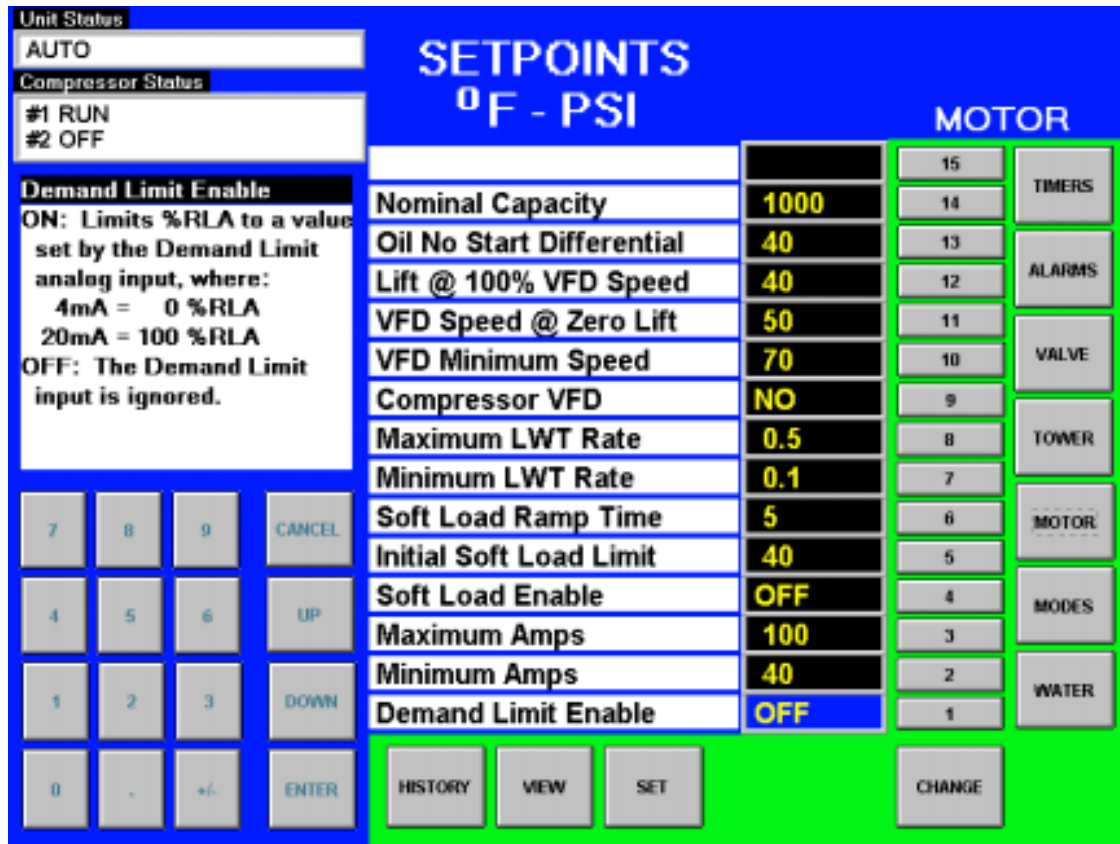
MOTOR Setpoint Screen

Figure 17, MOTOR Setpoint Screen

Table 15, MOTOR Setpoint Settings

Description	No.	Default	Range	Pass-word	Comments
Nominal Capacity	14		0 to 9999 Tons		Determines when to shut off a compressor
Oil No Start Diff (above Evap Temp)	13	40 °F	30 to 60 °F	T	Minimum Delta-T between oil sump temperature and saturated evaporator temperature
Lift @ Max Speed	12	40 °F	30 to 60 °F	T	Temp lift at 100 % speed (cond sat – evap sat temp)
Speed @ 0 Lift	11	50%	0 to 100%	T	Lift @ min speed as a % of 100 % lift
Minimum Speed	10	70%	60 to 100%	T	Min VFD speed, has priority over SPs 11 & 12
VFD	9	No	No, Yes	T	VFD on unit or not
Maximum Rate	8	0.5 °F/min	0.1 to 5.0 °F/min	M	Inhibits loading if LWT change exceed the setpoint value.
Minimum Rate	7	0.1 °F/min	0.0 to 5.0 °F/min	M	Additional compressor can start if LWT change is below setpoint.
Soft Load Ramp	6	5 min	1 to 60 min	M	Time period to go from initial load point (% RLA) set in SP 5 to 100% RLA
Initial Soft Load Amp Limit	5	40%	20 to 100%	M	Initial amps as % of RLA
Soft Load Enable	4	OFF	OFF, ON	M	Soft load on or off
Maximum Amps	3	100%	40 to 100%	T	% RLA above which loading is inhibited (Load Limit)
Minimum Amps	2	40%	20 to 80%	T	% RLA below which unloading is inhibited
Demand Limit Enable	1	OFF	OFF, ON	O	ON sets %RLA at 0% for 4 mA external signal and at 100% RLA for 20 mA signal

MODES Setpoints

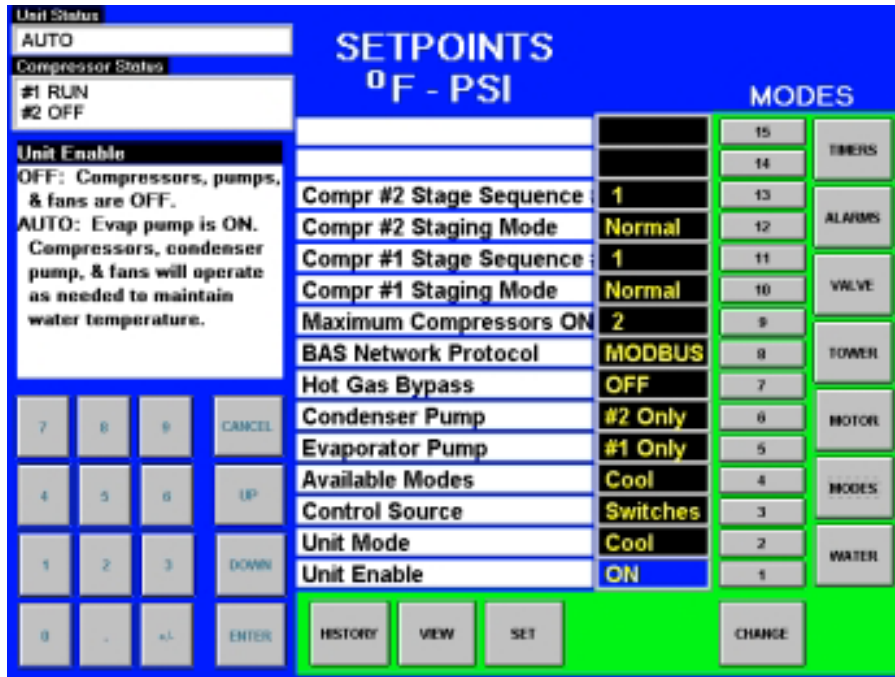*Figure 18. MODES Setpoint Screen*

Table 16, MODE Setpoint Settings

Description	No.	Default	Range	Pass-word	Comments
Comp # 2 Stage Sequence	13	1	1,2, … (# of Compressors)	M	Sets sequence number for # 2 compressor, if 1 it is always first to start, if 2 is always second (Note 1)
Comp # 2 Mode	12	Normal	Normal, Efficiency, Pump, Standby	M	Normal uses standard sequencing Efficiency starts one compressor on each dual unit Pump starts all compressors on one chiller first Standby uses this compressor only if another fails.
Comp #1 Stage Sequence	11	1	1,2, … (# of Compressors)	M	Sets sequence number for # 1 compressor, if 1 it is always first to start, if 2 is always second (Note 1)
Comp #1 Mode	10	Normal	Normal, Efficiency, Pump, Standby	M	Ditto No. 12.
Max. Comp. ON	9	16	1-16	M	Total number of compressors minus standby
BAS Protocol	8	LOCAL	LOCAL, BACnet, LonWorks, CAREL, MODBUS,	M	Sets BAS Standard Protocol to be used or LOCAL if none.
Hot Gas Bypass	7	30%	20 to 70%	T	% RLA below which HGBP solenoid is on
Cond Pump	6	Pump #1 Only	Pump #1 Only, Pump #2 Only, Auto Lead, #1 Primary, #2 Primary	M	Pump #1 Only, Pump #2 Only, use only these pumps AUTO, balance hours between #1 and #2 #1 Primary, #2 Primary, if primary fails, use other
Evap Pump	5	Pump #1 Only	Pump #1 Only, Pump #2 Only, Auto Lead, #1 Primary, #2 Primary	M	Pump #1 Only, Pump #2 Only, use only these pumps AUTO, balance hours between #1 and #2 #1 Primary, #2 Primary, if primary fails, use other
Available Modes	4	COOL	COOL, COOL/ICE, ICE, COOL/HEAT, HEAT	T	Sets modes that can be selected in SP 2
Control Source	3	LOCAL	LOCAL, BAS, SWITCH	O	Sets control source
Unit Mode	2	COOL	COOL, ICE, HEAT, TEST	O T	Selects from MODES in SP4
Unit Enable	1	OFF	OFF, ON	O	OFF, everything is off. ON, Evap pump on, comp, cond pump and tower on as required to meet LWT

Note: If both compressors have the same sequence number, they will automatically balance starts and run-hours.

WATER Setpoints

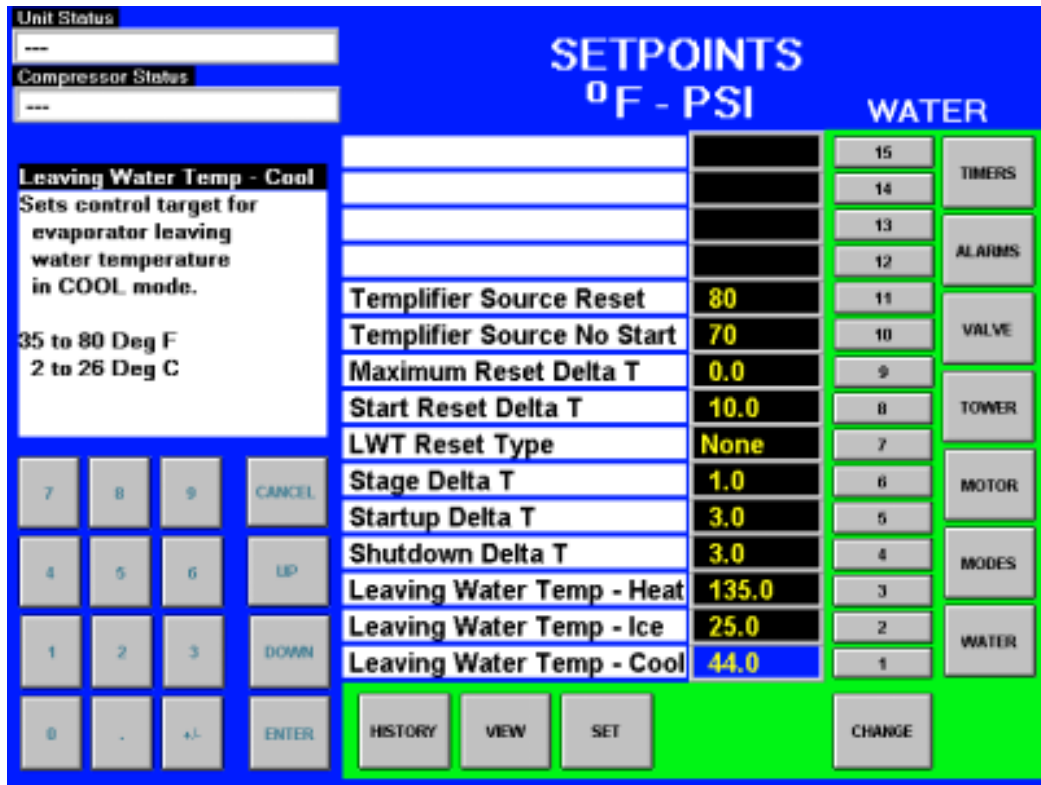*Figure 19, WATER Setpoint Screen*

Table 17, WATER Setpoint Settings

Description	N0.	Default	Range	Pass-word	Comments
Templifier Source Water Reset (Delta-T)	11	80°F	60 to 100 °F	T	Resets the condenser leaving temperature downward if source leaving drops under the delta-T. Setting is a function of comp selection.
Templifier Source No Start	10	80°F	50 to 100°F	T	Entering source water temperature below which the unit cannot start.
Max Reset Delta T	9	0.0°F	0.0 to 20.0 °F	M	Set the maximum reset that can occur, in degrees F if LWT reset is selected or max reset at 20 mA input if 4-20 mA is selected in SP7
Start Reset Delta T	8	10. 0°F	0.0 to 20.0 °F	M	Sets the evap delta-T above which Return reset begins.
LWT Reset Type	7	NONE	NONE, RETURN, 4-20mA	M	Select reset type, NONE for none, RETURN for reseting chilled water based on the entering water, or 4-20 mA for external analog signal
Stage Delta T	6		0.5 to 5°F	M	Sets the temperature the leaving water must be below setpoint for next compressor to start.
Startup Delta T	5	3.0°F	0.0 to 10.0 °F	M	Degrees above setpoint for compressor to start.
Shutdown Delta T	4	3.0°F	0.0 to 3.0 °F	M	Degrees below setpoint for compressor to stop.
Cool LWT	3	44. 0°F	35.0 to 80.0 °F	M	Evaporator LWT setpoint in COOL mode
Ice LWT	2	25. 0°F	15.0 to 35.0 °F	M	Evaporator LWT setpoint in the ICE mode
Heat LWT	1	135. 0°F	100.0 to 150.0 °F	M	Condenser LWT setpoint in HEAT (Templifier) mode

SERVICE Screen

Figure 20, Service Screen

The SERVICE screen is accessed by pressing SET from any SET screen. In other words, it is the second "SET" screen. While containing information and activity buttons for the service technician, it also has valuable information for the operator.

The upper left corner contains compressor information as shown above. The screen illustrated is for a dual compressor unit, a single, of course, would show data for only one compressor. "Spare Capacity" is used to set the compressor starting/stopping increment for dual compressors.

The version numbers shown in the lower left corner are the controllers' software identification. The number in the upper right corner is the Operator Interface Panel software identification number. These numbers may be required by McQuay to answer questions about unit operation or to assist in possible future upgrades of software.

The PASSWORD button is used to access the Keyboard screen to enter a password.

HISTORY Screens

*Figure 21, History Trend Graph*
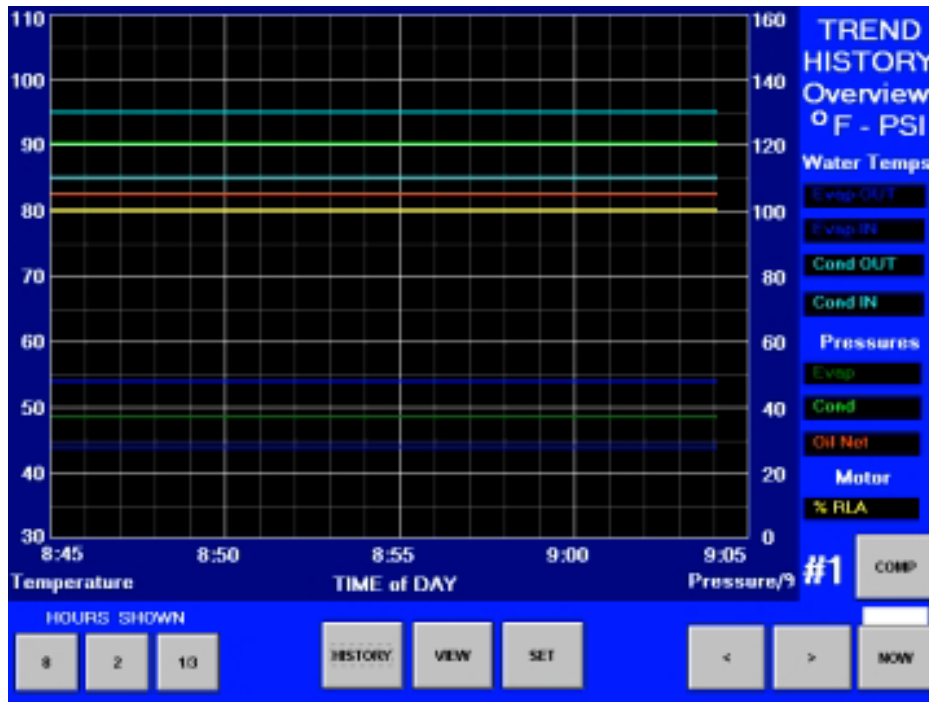
The Trend History Overview allows the user to view the various parameters listed on the right side of the screen. The temperature scale in °F is on the left. Pressure in psi and % RLA are represented by the right-hand scale. The screen can display history for 8 hour, 2 hour or 20-minute periods by pressing 8, 2, or 1/3 respectively. Some software versions have a 24 hour instead of an 8 hour period.

Pressing NOW for any time period will start the display for the current time beginning on the right of the screen with history flowing to the left.

The arrow buttons scroll the time period forward or backward. Obviously if NOW is selected, the forward button > will not go into the future.

Figure 22, Alarm History/Floppy Download
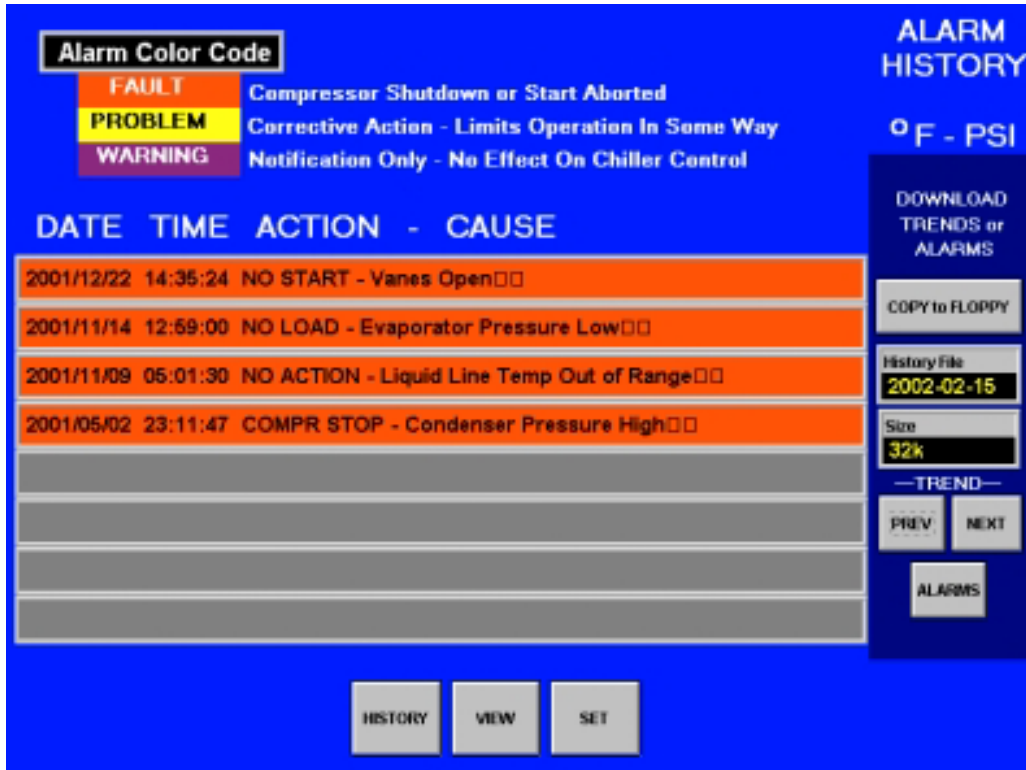
The Alarm History lists the alarms with the most current on top with date stamp, action taken and the cause of the alarm.

Download to Floppy Disc

This screen is also used to download the Trend History (Figure 21) selected by date *or* the Alarm History shown above. To download, place a floppy disc in the drive on the right side of the Operator Interface Panel and:

- For Alarms, press the ALARMS button on the screen, then press the COPY to FLOPPY button.

- For Trend History, select the desired History File by date using the PREV or NEXT buttons, then press the COPY to FLOPPY button.

ACTIVE ALARM Screen

Figure 23, Active Alarms

The Active Alarm screen is only accessible when an active alarm exists on the unit. Pressing the red alarm signal on any screen will access this screen.

Alarms are arranged in increasing priority with higher priority alarms replacing any lower priority alarms that may exist. Once the abnormal condition is corrected, pressing the "CLEAR" key will clear the alarm.

The current active alarms (there may be more than one) are displayed. Note that the alarms are color-coded red for FAULT (equipment protection control) that causes a rapid compressor shutdown, yellow for PROBLEM (limit alarm) that will inhibit loading, or load or unload the compressor, and blue for WARNING which is information only and takes no action.

The date/time and cause of the alarm are displayed.

After eliminating the cause of the alarm, clear the alarm by pressing the CLEAR button. This will clear the alarm from the register and allow the unit to restart after going through the start sequence. The alarm notice will be deleted from the screen.

However, if the cause of the alarm is not remedied, the alarm is still active and the alarm message will immediately reappear. The unit will not begin its starting sequence, and the alarm will be re-registered in the alarm history list. This means that a single alarm occurrence could appear many times in the alarm history if it is repeatedly cleared on the active alarm screen but the cause not actually cleared on the unit.

Alarms fall into three distinct categories: Faults, Problems, and Warnings as detailed in the following section.

Fault Alarms

The following table identifies each fault alarm, its display, gives the condition that causes the alarm to occur, and states the action taken because of the alarm. All fault alarms require a manual reset.

Table 18, Fault Alarm Description

Description	Display	Occurs When:	Action Taken
Low Evaporator Pressure	Lo Evap Pressure-SD	Evaporator Press < Low Evap Pressure SP	Rapid Stop
High Condenser Pressure	Hi Condenser Press	Cond Press > High Condenser Pressure SP	Rapid Stop
Vanes Open No Start		Compressor state = PRELUBE for 30 sec after Prelube timer expires	Rapid Stop
Low Oil Delta Pressure	Lo Oil Delta Pressure-SD	(Comp State=PRELUBE, RUN, UNLOAD, or POSTLUBE) & Net Oil Press < Low Net Oil Press SP	Rapid Stop
Low Oil Feed Temperature	Low Oil Feed Temp	(Comp State=RUN or UNLOAD) & Oil Feed temp < (Evap Saturated Refr Temp + Low Oil Delta Temperature SP) for > 1 min	Rapid Stop
High Oil Feed Temperature	High Oil Feed Temp	Temp > High Oil Feed Temperature SP (only at End of PRELUBE)	Rapid Stop
Low Motor Current	Low Motor Current	I < Motor Current Threshold with Compressor ON for 30 sec	Rapid Stop
High Discharge Temperature	Hi Disch Line Temp	Temp > High Discharge Temperature SP	Rapid Stop
Mechanical High Pressure	Mech Hi Pres Switch	Digital Input = High Pressure	Rapid Stop
High Motor Temperature	High Motor Temp	Digital Input = High Temperature	Rapid Stop
Surge High Suct SH-Starting	Hi Suction Superht	Temp > Surge High Suct SH-Start SP during first 5 minutes of Compressor ON	Rapid Stop
Surge High Suct SH-Running	Hi Suction Superht	Temp > Surge High Suct SH-Run SP after first 5 minutes of Compressor ON	Rapid Stop
No Starter Transition	No Starter Transition	Starter Transition Digital Input = No Transition AND Compressor ON for > 15 seconds	Rapid Stop
No Compressor Stop		%RLA > Motor Current Threshold SP with Compressor OFF for 30 sec	Annunciation
Starter Fault	Starter Fault	Starter Fault Digital Input = Fault AND Compressor State = START, PRELUBE, RUN, or UNLOAD	Rapid Stop
No Oil Pressure Start		Compressor State = START for 30 sec	Rapid Stop
Leaving Evaporator Water Temperature Sensor Fault	Lvg Evap T Sen Fail	Sensor shorted or open	Rapid Stop
Evaporator Pressure Sensor Fault	Evap Press Sen Fail	Sensor shorted or open	Rapid Stop
Condenser Pressure Sensor Fault	Cond Press Sen Fail	Sensor shorted or open	Rapid Stop
Suction Temperature Sensor Fault	Suction T Sen Fail	Sensor shorted or open	Rapid Stop
Discharge Temperature Sensor Fault	Discharg T Sen Fail	Sensor shorted or open	Rapid Stop
Oil Feed Temperature Sensor Fault	Oil Feed T Sen Fail	Sensor shorted or open	Rapid Stop
Oil Sump Temperature Sensor Fault	Oil Sump T Sen Fail	Sensor shorted or open	Rapid Stop
Oil Feed Pressure Sensor Fault		Sensor shorted or open	Rapid Stop
Oil Sump Pressure Sensor Fault		Sensor shorted or open	Rapid Stop

Problem Alarms

The following alarms do not cause compressor shutdown but limit operation of the chiller in some way as described in the Action Taken column. A limit alarm will trigger the red alarm screen and the digital output for the optional remote alarm.

Table 19, Problem Alarm Description

| Description	Display	Occurs When:	Action Taken	Reset
Low Evaporator Pressure – Inhibit Loading	Lo Evap Press-NoLoad	Pressure < Low Evap Pressure–Inhibit setpoint	Inhibit loading	Evap Press rises above (SP + 3psi)
Low Evaporator Pressure – Unload	Low Evap Press-Unload	Pressure < Low Evap Pressure–Unload setpoint	Unload	Evap Press rises above (SP + 3psi)
Evaporator Freeze Protect	Evap Pres Lo-Freeze	Evap Sat Refr Temp < Evaporator Freeze SP	Start evaporator pump	Temp > (Evaporator Freeze SP + 2°F)
Condenser Freeze Protect	Cond Pres Lo-Freeze	Cond Sat Refr Temp < Condenser Freeze SP	Start condenser pump	Temp > (Condenser Freeze SP + 2°F)
High Discharge Temperature	High Discharge T-Load	Temperature > High Discharge Temperature-Load SP AND Suction superheat < 15°F	Load	Temp < (High Dsch Temp Load SP – 3°F) OR Superheat > 18°F

Warning Alarms

A warning is enunciated whenever an abnormal condition exists which does not affect chiller operation.

Table 20, Warning Alarm Description

WARNING	DISPLAY	CONDITION
Liquid Line Refrigerant Temperature Sensor Fall Warning	Liq Line T Sen Warn	Sensor is shorted or open
Entering Evaporator Water Temperature Sensor Fall Warning	Ent Evap T Sen Warn	Sensor is shorted or open
Leaving Condenser Water Temperature Sensor Fail Warning	Lvg Cond T Sen	Sensor is shorted or open
Low Discharge Superheat	Low Disch Superheat	Discharge Superheat temperature is lower than acceptable range for more than 3 minutes (adjustable)
High Discharge Superheat	Hi Disch Superheat	Discharge Superheat temperature is higher than acceptable range for more than 3 minutes (adjustable)

Figure 24, Keyboard
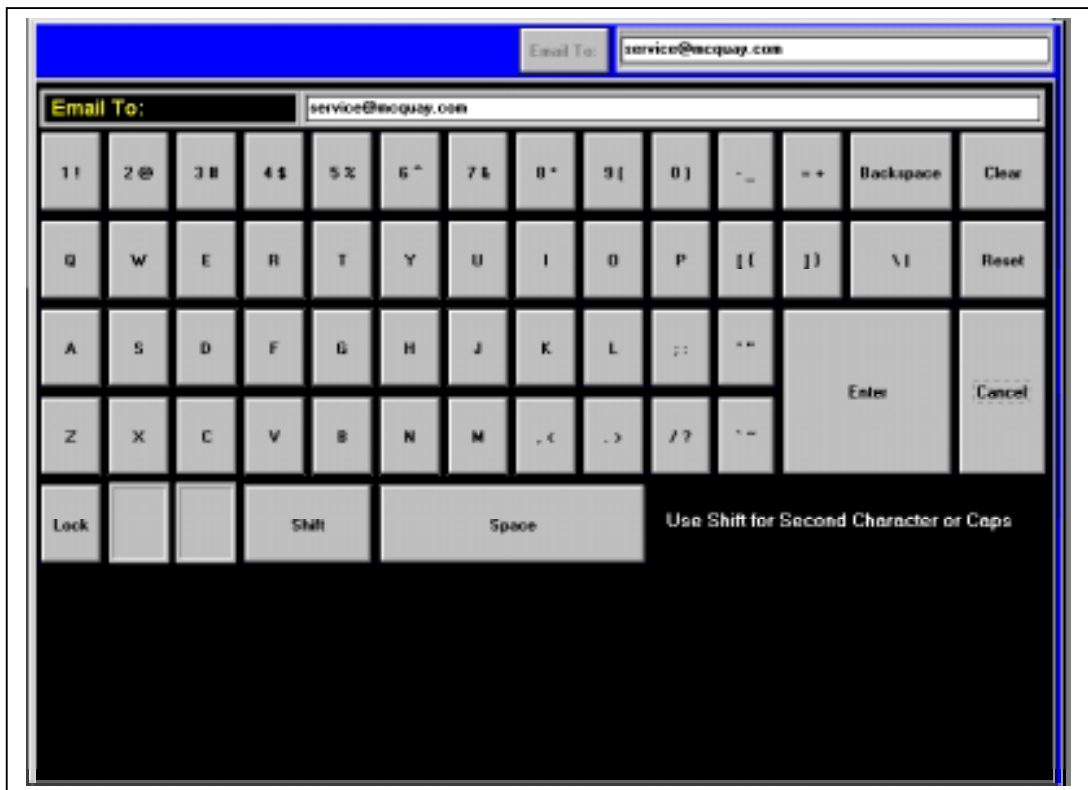
The keyboard is used for the following activities:

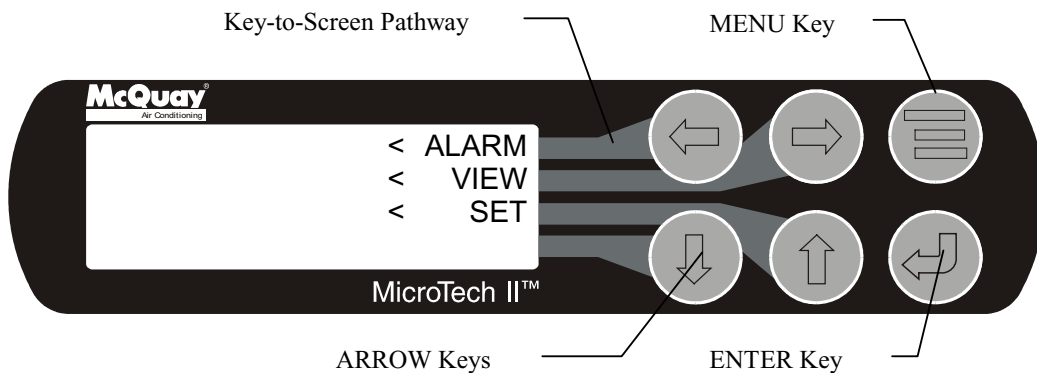1. Entering the password when attempting to enter or change a setpoint.

Unit Controller

A general description of the unit controller with its inputs and outputs is on page 7. This section will describe the operation of the controller, define the screen hierarchy and how to navigate through it and also give a description of the screens.

4x20 Display & Keypad

Layout
The 4-line by 20-character/line liquid crystal display and 6-key keypad are shown below.

Figure 25, Display (in MENU mode) and Keypad Layout

Note that each ARROW key has a pathway to a line in the display. Pressing an ARROW key will activate the associated line when in the MENU mode.

Getting Started
There are two basic procedures to learn in order to utilize the MicroTech II controller:

1. Navigating through the menu matrix to reach a desired menu screen and knowing where a particular screen is located.

2. Knowing what is contained in a menu screen and how to read that information or how to change a setpoint contained in the menu screen.

Navigating

The menus are arranged in a matrix of screens across a top horizontal row. Some of these top-level screens have sub-screens located under them. The general content of each screen and its location in the matrix are shown in Figure 27 on page 40. A detailed description of each menu screen begins on page 41.

There are two ways to navigate through the menu matrix to reach a desired menu screen.

1) One is to scroll through the matrix from one screen to another using the four ARROW keys.

2) Another way is to use shortcuts to work through the matrix hierarchy. From any menu screen,

   a) Pressing the MENU key will take you to the top level of the hierarchy. The display will show ALARM, VIEW, and SET as shown in Figure 25. One of these groups of screens can then be selected by pressing the key connected to it via the pathway shown in Figure 25.

b) Depending on the top-level selected, a second level of screens will appear. For example, selecting ALARM will go the next level of menus under ALARM (ALARM LOG or ACTIVE ALARM). Selecting VIEW will go the next level of menus (VIEW COMPRESSOR STATUS, VIEW UNIT STATUS, VIEW EVAPORATOR, or VIEW CONDENSER). Selecting SET will go to a series of menus for looking at and changing setpoints.

c) After selecting this second level, the desired screen can be acquired using the arrow keys. A typical final screen is shown below.

Pressing the MENU key from any menu screen will automatically return you to the MENU mode as shown in Figure 25.

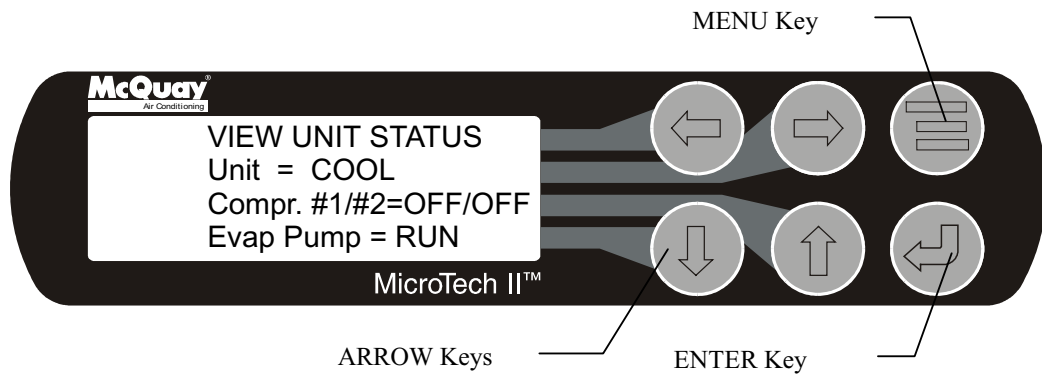### Figure 26, Typical Menu Display and Keypad Layout

MENU Key

McQuay
Air Conditioning

VIEW UNIT STATUS
Unit = COOL
Compr. #1/#2=OFF/OFF
Evap Pump = RUN

MicroTech II™

ARROW Keys

ENTER Key

Figure 27, Unit/Compressor Controller Menu Matrix

VIEW UNIT STATUS	VIEW UNIT WATER	VIEW UNIT REFRG	VIEW UNIT TOWER	VIEW COMP #1	VIEW COMP #2	VIEW EVAP	VIEW COND	ALARM LOG	ALARM ACTIVE	SET UNIT SPs	SET COMP #1 SPs	SET COMP #2 SPs	SET ALARM LMTS	SET TOWER	TEST UNIT	TEST COMP #1	TEST COMP #2
VIEW UNIT STATUS	VIEW UNIT WATER	VIEW UNIT REFRG (1)	VIEW UNIT TOWER (1)	VIEW COMP #1 (1)	VIEW COMP #2 (1)	VIEW EVAP	VIEW COND	ALARM LOG (1)	ALARM ACTIVE (1)	SET UNIT SPs (1)	SET COMP #1 SPs (1)	SET COMP #2 SPs (1)	SET ALARM LMTS (1)	SET TOWER (1)	TEST UNIT (1)	TEST COMP #1 (1)	TEST COMP #2 (1)
		VIEW UNIT REFRG (2)	VIEW UNIT TOWER (2)	VIEW COMP #1 (2)	VIEW COMP #2 (2)			. . .	. . .	SET UNIT SPs (2)	SET COMP #1 SPs (2)	SET COMP #2 SPs (2)	SET ALARM LMTS (2)	SET TOWER (2)	TEST UNIT (2)	TEST COMP #1 (2)	TEST COMP #2 (2)
				VIEW COMP #1 (3)	VIEW COMP #2 (3)			. . .	. . .	SET UNIT SPs (3)	SET COMP #1 SPs (3)	SET COMP #2 SPs (3)	SET ALARM LMTS (3)	SET TOWER (3)	TEST UNIT (3)	TEST COMP #1 (3)	TEST COMP #2 (3)
				VIEW COMP #1 (4)	VIEW COMP #2 (4)			ALARM LOG (n)	ALARM ACTIVE (n)	SET UNIT SPs (4)	SET COMP #1 SPs (4)	SET COMP #2 SPs (4)	SET ALARM LMTS (4)	SET TOWER (4)	TEST UNIT (4)	TEST COMP #1 (4)	TEST COMP #2 (4)
										SET UNIT SPs (5)	SET COMP #1 SPs (5)	SET COMP #2 SPs (5)	SET ALARM LMTS (5)	SET TOWER (5)		TEST COMP #1 (5)	TEST COMP #2 (5)
										↓	SET COMP #1 SPs (6)	SET COMP #2 SPs (6)		SET TOWER (6)			
										SET UNIT SPs (12)	SET COMP #1 SPs (7)	SET COMP #2 SPs (7)		SET TOWER (7)			
										ENTER PASS WORD	SET COMP #1 SPs (8)	SET COMP #2 SPs (8)		SET TOWER (8)			

Screen Content

Figure 28, View Screens

VIEW UNIT STATUS UNIT= Cmps 1 OFF 　　2 OFF Ev/Cn Pmps= /	VIEW UNIT WATER °F . .　In Out Delta Evap Cond	VIEW UNIT REFRG (1)　. .　　°psi　F Sat Evap Sat Cond	VIEW UNIT TOWER(1) Stages ON= of EntCondTemp= Setpoint=	VIEW COMP #1 (1) State　= % RLA　= %. Evap LWT = °F	VIEW COMP #2 (1) State　= % RLA　= %. Evap LWT = °F	VIEW EVAPORATOR Suct SH　= Approach = .	VIEW CONDENSER Disch SH　= Approach = Subcooling=
		VIEW UNIT REFRG (2) Suct Line　= Liquid Line = Lift Press　=	VIEW UNIT TOWER(2) Bypass Valve = VFD Speed　=	VIEW COMP (2) Cond Press = Evap Press = Lift Press　=	VIEW COMP #2 (2) Cond Press = Evap Press = Lift Press　=		
				VIEW COMP (3) Vent Press = Feed Press = Net Press　=	VIEW COMP #2 (3) Vent Press = Feed Press = Net Press　=		
				VIEW COMP (4) Sump Temp = Feed Temp　=	VIEW COMP #2 (4) Sump Temp = Feed Temp　=		
				VIEW COMP (5) . 　　Temp SH Suction °F　°F Dischrg °F　°F	VIEW COMP #2 (5) . 　　Temp SH Suction °F　°F Dischrg °F　°F		
				VIEW COMP (6) .　　. 　　Sat Temp Evap　　　°F Cond　　　°F	VIEW COMP #2 (6) . 　　Sat Temp Evap　　　°F Cond　　　°F		
				VIEW COMP (7) Hours = Starts =	VIEW COMP #2 (7) Hours = Starts =		

Alarm Screens

ALARM LOG (1) Description .Time　Date	ACTIVE ALARM .Time　Date Fault Description….
ALARM LOG (2) Description Time　Date	
ALARM LOG (N) Description Time　Date	

Set Screens

SET UNIT SPs (1)	SET COMP #1SPs (1)	SET COMP#2 SPs	SET ALARM SPs (1)	SET TOWER SPs (1)
Enable = Mode = Source =	Demand Limit= Minimum Amps = % Maximum Amps= %	(1) Demand Limit= Minimum Amps= % Maximum Amps= %	LowEv PrHold = Low Ev Pr Unld = Low Ev Pr Stop =	TowerControl-Temp = TowerStages = StageUp/Dn = xxx/xxx
SET UNIT SPs (2) Available Modes Select w/Unit Off	**SET COMP#2 SPs (2)** StageMode = StageSequence# = Max Compr ON =	**SET COMP#2 SPs** (2) StageMode = StageSequence# = Max Compr ON =	**SET ALARM SPs (2)** High Cond Pr = HiDiscT-Load = HiDiscT-Stop =	**SET TOWER SPs (2)** StageOn(Temp) °F #1 #2 #3 #4 xxx xxx xxx xxx
SET UNIT SPs (3) Cool LWT = Ice LWT = Heat LWT =	**SET COMP SPs (3)** StageDeltaT = Stop-Srart = min Start-Start = min	**SET COMP#2 SPs** (3) StageDeltaT = Stop-Srart = min Start-Start = min	**SET ALARM SPs (3)** High HiOilFeedTemp = LowOilDeltaT = LowNetOilPr =	**SET TOWER SPs (3)** StageDiff = StageUp = StageDown =
SET UNIT SPs (4) Leaving Water Temp. StartDelta = StopDelta =	**SET COMP SPs (4)** Full Load = sec	**SET COMP#2 SPs (4)** Full Load = sec	**SET ALARM SPs (4)** HighSSH-Start = HighSSH-Run = MtrCurrThrshld =	**SET TOWER SPs (4)** Valve/VFDControl = ValveSp/VFDStage ValveType =
SET UNIT SPs (5) Rest Type = Max Reset DT = Strt Reset DT =	**SET COMP SPs (5)** OilNoStrtDiff= Abs Capacity = T HotGasBypass = %	**SET COMP#2 SPs (5)** OilNoStrtDiff= Abs Capacity = T HotGasBypass = %	**SET ALARM SPs (5)** EvapFreeze = CondFreeze =	**SET TOWER SPs (5)** Valve SP = Valve DB =
SET UNIT SPs (6) Soft Load = BeginAmpLimit = SoftLoadRamp =	**SET COMP SPs (6)** Unload Timer = sec PreLubeTmrs= sec PostLub Tmrs= sec	**SET COMP#2 SPs (6)** Unload Timer = sec PreLubeTmrs= sec PostLub Tmrs= sec		**SET TOWER SPs (6)** Valve Start Position Min = xxx%@xxx°F Max = xxx%@xxx°F
SET UNIT SPs (7) Max/Min LWT Rates Max = /min Min = /min	**SET COMP SPs (7)** VaneMode = Vanes = %RLA= %	**SET COMP#2 SPs** (7) VaneMode = Vanes = %RLA= %		**SET TOWER SPs (7)** Valve Control Range Min = % Max = %
SET UNIT SPs (8) EvapRecTmr = min EvapPump = CondPump =	**SET COMP SPs (8)** VFD Mode = VFD = % %RLA = %	**SET COMP#2 SPs** (8) VFD Mode = VFD = % %RLA = %		**SET TOWER SPs (8)** PD Control Loop Error Gain = % Slope Gain = %
SET UNIT SPs (9) Templifier SrcNoStart = SourceReset=	**SET COMP SPs (9)** Protocol = Ident Number = Baud Rate =	**SET COMP SPs (9)** Protocol = Ident Number = Baud Rate =		
SET UNIT SPs (10) VFD = Min Speed = % Spd/Lift = %/	**SET COMP SPs (10)** Refrig Sat Pressure Evap Offsert = Cond Offset =	**SET COMP SPs (10)** Refrig Sat Pressure Evap Offsert = Cond Offset =		
SET UNIT SPs (11) . CLOCK Day/Mon/Yr 24 hr time day of wk				
SET UNIT SPs (12) Units = . Lang = English				
SUPERVISOR SETUP Protocol = Ident Numbe r= Baud Rate =				
SET UNIT OFFSET (14) Entering Water Temp Evap = °F Cond = °F				
SET UNIT OFFSET (15) Leaving Water Temp Cond = °F .				
SET Comp Offset (16) Refreg Sat Pressure Evap = psi Cond = psi				

Screen Descriptions

VIEW Screens

VIEW Screens are only for viewing the operation of the unit and compressors. No data is input into VIEW Screens. The following screens are shown in °F/psi. When the Display Units set point is set to °C/kPa, the units and values will change accordingly.

View Unit Status (Single Compressor)

```
VIEW UNIT STATUS
Unit=COOL
Compressor=LOAD
Ev/Cn Pmps=STRT/RUN
```

Unit status can be OFF, COOL, ICE, HEAT, and ALARM as determined from the Unit State variable, the Unit Mode setpoint, the Unit Enable and the presence of a shutdown alarm. Compressor states can be OFF, START, PRELUBE, HOLD, LOAD, UNLOAD, POSTLUBE, and ALARM as determined from the Comp State variable and the Load and Unload outputs, and the presence of a compressor shutdown alarm. Evap and Cond Pump states can be OFF, STRT (start), & RUN

View Unit Status (Dual Compressor)

```
VIEW UNIT STATUS
Unit=COOL
Cmp1/2= LOAD /POSTLB
Ev/Cn Pmps=STRT/RUN
```

Unit states can be OFF, COOL, ICE, HEAT, and ALARM as determined from the Unit State variable, the Unit Mode setpoint, and the presence of a unit shutdown alarm. Compressor states can be OFF, START, PRELB, HOLD, LOAD, UNLOAD, POSTLB, and ALARM as determined from the Comp State variable, the Load and Unload outputs, and the presence of a compressor shutdown alarm. Evap and Cond Pump states can be OFF, STRT (start), & RUN

View Unit Water

```
VIEW UNIT WATER °F
      In   Out  Delta
Evap XX.X XX.X  XX.X
Cond XX.X XX.X  XX.X
```

View Unit Refrigerant

°F/psi   °C/kPa

```
VIEW UNIT REFRG (1)   VIEW UNIT REFRG (1)
         psi     °F             kPa     °C
Sat Evap XXX.X   XX.X Sat Evap XXXX    XX.X
Sat Cond XXX.X   XX.X Sat Cond XXXX    XX.X
```

```
VIEW UNIT REFRG (2)
Suct Line  = XXX.X°F
Liquid Line= XXX.X°F
Lift Press =XXXX psi
```

View Unit Tower

Tower Control = Temp/None	Tower Control = Lift
| ```
VIEW UNIT TOWER (1)
Stages ON = 2 of 4
EntCondTemp = XXX °F
    Setpoint = XXX °F
``` | ```
VIEW UNIT TOWER (1)
Stages ON = 2 of 4
LiftPress = XXXX psi
 Setpoint = XXXX psi
``` |

The first Stages ON value is the number of fan stages ON. The second number is the Tower Stages set point, i.e. the number of stages set, selectable from 0 to 4 (0 if Tower Control = None). The bottom line is the setpoint, °F or psi will show on the screen depending on whether TEMP (°F) or LIFT (psi) is selected in the Cooling Tower Control setpoint.

```
VIEW UNIT TOWER (2)
Bypass Valve = XXX%
VFD Speed    = XXX%
```

The Bypass Valve value is "None" (in place of XXX%) if the Valve/VFD Control set point = None or VFD Stage. The VFD Speed value is "None" if the Valve/VFD Control set point = None, Valve Setpoint, or Valve Stage.

View Compressor

NOTE: In the following VIEW COMP screens, the #N field indicates which compressor (#1, and #2 for dual compressor units.) is being viewed.

```
VIEW COMP#N (1)
State    = RUN
% RLA    = XXX %
Evap LWT = °F
```

State settings can be OFF, START, PRELUBE, HOLD, LOAD, UNLOAD, SHUTDOWN, POSTLUBE, and ALARM as determined from the Comp State variable, the Load and Unload outputs, and the presence of a compressor shutdown alarm.

```
VIEW COMP#N (2)
Cond Press =
Evap Press =
Lift Press =
```

```
VIEW COMP#N (3)
Vent Press =XXXX psi
Feed Press =XXXX psi
Net Press  = XXX psi
```

```
VIEW COMP#N (4)
Sump Temp =
Feed Temp =
```

```
VIEW COMP#N (5)
          Temp  SH
Suction   xxx°F xx°F
Discharge xxx°F xx°F
```

```
VIEW COMP#N (6)
             Psi   °F
Sat Evap
Sat Cond
```

```
VIEW COMP#N (7)
Hours =
Starts =
```

View Evaporator

```
VIEW EVAPORATOR
Suct SH   = XXX.X °F
Approach  =  XX.X °F
```

View Condenser

```
VIEW CONDENSER
Disch SH = XXX.X °F
Approach =  XX.X °F
Subcooling= XX.X °F
```

View ALARM Screens

The following screens are shown in °F/psi. When the Display Units set point is set to °C/kPa, the units and values shall change accordingly.

View Alarm Log

```
ALARM LOG (1)
Alarm Description

hh:mm:ss dd/mmm/yyyy
```

```
ALARM LOG (2)
Alarm Description

hh:mm:ss dd/mmm/yyyy
```
The ALARM LOG contains data on the last 25 alarms

Active Alarm Screen

Active Alarms

```
ALARM ACTIVE (1)
Alarm Description
hh:mm:ss dd/mmm/yyyy
<Press Edit to CLEAR
```
Note: see page 60 for instructions on clearing alarms.

SET Screens

The PW (password) column indicates the password that must be active in order to change the set point. Codes are as follows:

- O = Operator (password is 100)

- M = Manager

- T = Technician (not available through the 4x20 display/keypad)
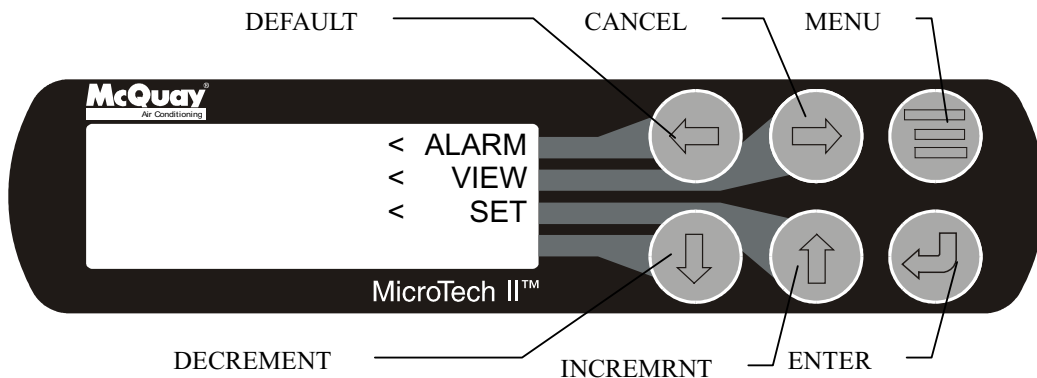
Editing Setpoints

In order to enter or change a setpoint, the appropriate screen must first be accessed. There are two ways to get to the desired menu screen:

1. Scrolling, The scroll method allows the user to move about the matrix (from one menu to another, one at a time) by using the four ARROW keys. The menu matrix is shown in Figure 27 on page 40.

2. The MENU key can be used as a shortcut to specific groups of menus within the matrix.

Pressing the MENU key from any menu screen will automatically return you to the MENU mode.

Editing is accomplished by pressing the ENTER key until the desired field is selected. This field is indicated by a blinking cursor under it. The arrow keys will then operate as defined below.

Left Arrow Key = CANCEL   Reset the current field to the value it had when editing began.

Right Arrow Fey = DEFAULT   Set value to original factory setting.

Up Key = INCREMENT   Increase the value or select the next item in a list.

Down Key = DECREMENT   Decrease the value or select the previous item in a list.

These four edit functions are indicated by one-character abbreviation on the right side of the display (this mode is entered by pressing the ENTER key).

Most menus containing set point values have several different setpoints shown on one menu. When in a setpoint menu, the ENTER key is used to proceed from the top line to the second line and on downward. The cursor will blink at the entry point for making a change. The ARROW keys (now in the edit mode) are used to change the set point as described above. When the change has been made, press the ENTER key to enter it. Nothing is changed until the ENTER key is pressed.

For example, to change the chilled water setpoint:

1. Press MENU key to go to the MENU mode.

2. Press SET (the UP Key) to go to the setpoint menus.

3. Press UNIT SPs (the Right key) to go to setpoints associated with unit operation.

4. Press the DOWN key to scroll down through the setpoint menus to the third menu screen which contains Evap LWT=XX.X°F.

5. Press the ENTER key to move the cursor down from the top line to the second line in order to make the change.

6. Use the ARROW keys (now in the edit mode as shown above) to change the setting.

7. When the desired value is achieved, press ENTER to enter it and also move the cursor down.

At this point, the following actions can be taken:

1. Change another setpoint in this menu by scrolling to it with the ENTER key.

2. Using the ENTER key, scroll to the first line in the menu. From there the ARROW keys can be used to scroll to different menus.

During edit mode, the display will show a two-character wide menu pane on the right as shown below. They stand for; Default, Cancel, (+) increase, (-) Decrease

```
SET UNIT SPs (X)    <D
       (data)       <C
       (data)       <+
       (data)       <-
```

Additional fields can be edited by pressing the ENTER key until the desired field is selected. When the last field is selected, pressing the ENTER key switches the display out of "edit" mode and returns the arrow keys to "scroll" mode.

Unit Controller Setpoints

Table 21, Unit Setpoints

Description	Default	Range	PW
Unit			
Unit Enable	OFF	OFF, ON	O
Unit Mode	COOL	COOL, ICE, HEAT, TEST	O T
Available Modes	COOL	COOL, COOL/ICE, ICE, COOL/HEAT, HEAT	T
Mode Source	KEYPAD	LOCAL, BAS, DIGITAL INPUT	O
Display Units	°F/psi	°F/psi, °C/kPa	O
Language	ENGLISH	ENGLISH, (TBD)	O
BAS Protocol	NONE	NONE, BACnet, LonWorks, CAREL, MODBUS, N2	M
Leaving Water			
Cool LWT	44. 0°F	35.0 to 80.0 °F	O
Ice LWT	25. 0°F	15.0 to 35.0 °F	O
Heat LWT	135. 0°F	100.0 to 150.0 °F	O
Startup Delta T	3.0°F	0.0 to 10.0 °F	O
Shutdown Delta T	3.0°F	0.0 to 3.0 °F	O
LWT Reset Type	NONE	NONE, RETURN, 4-20mA	M
Max Reset Delta T	0.0°F	0.0 to 20.0 °F	M
Start Reset Delta T	10. 0°F	0.0 to 20.0 °F	M
Templifier			
Source Water Reset	80 °F	60 to 100 °F	T
Timers			
Evap Recirculate	30 sec	15 sec to 5 min	M
Pumps			
Evap Pump	Pump #1 Only	Pump #1 Only, Pump #2 Only, Auto Lead, #1 Primary, #2 Primary	M
Cond Pump	Pump #1 Only	Pump #1 Only, Pump #2 Only, Auto Lead, #1 Primary, #2 Primary	M
Cooling Tower			
Tower Control	None	None, Temperature, Lift	M
Tower Stages	2	1 to 4	M
Stage Up Time	2 min	1 to 60 min	M
Stage Down Time	5 min	1 to 60 min	M
Stage Differential (Temp)	3.0 °F	1.0 to 10.0 °F	M
Stage Differential (Lift)	6.0 psi	1.0 to 20.0 psi	M
Stage #1 On (Temp)	70 °F	40 to 120 °F	M
Stage #2 On (Temp)	75 °F	40 to 120 °F	M
Stage #3 On (Temp)	80 °F	40 to 120 °F	M
Stage #4 On (Temp)	85 °F	40 to 120 °F	M
Stage #1 On (Lift)	35 psi	10 to 130 psi	M
Stage #2 On (Lift)	45 psi	10 to 130 psi	M
Stage #3 On (Lift)	55 psi	10 to 130 psi	M
Stage #4 On (Lift)	65 psi	10 to 130 psi	M
Cooling TowerValve / VFD			
Valve/VFD Control	None	None, Valve Setpoint, Valve Stage, VFD Stage, Valve SP/VFD Stage	M
Valve Setpoint (Temp)	65 °F	40 to 120 °F	M
Valve Setpoint (Lift)	30 psi	10 to 130 psi	M
Valve Deadband (Temp)	2.0 °F	1.0 to 10.0 °F	M
Valve Deadband (Lift)	4.0 psi	1.0 to 20.0 psi	M
Stage Down @	20%	0 to 100%	M
Stage Up @	80%	0 to 100%	M
Valve Control Range (Min)	10%	0 to 100%	M
Valve Control Range(Max)	90%	0 to 100%	M
Valve Type	NC (To Tower)	NC, NO	M
Minimum Start Position	0%	0 to 100%	M
Minimum Position @	60 °F	0 to 100 °F	M
Maximum Start Position	100%	0 to 100%	M
Maximum Position @	90 °F	0 to 100 °F	M
Error Gain	25	10 to 99	M
Slope Gain	25	10 to 99	M

The following screens are shown in °F/psi. When the Display Units set point is set to °C/kPa, the units and values change accordingly.

Set Unit Setpoints

```
SET UNIT SPs (1)
Unit Enable = OFF
Unit Mode   = COOL
Source = Local
```

Unit Enable settings can be OFF and ON as determined from the Unit Enable set point. Unit Mode settings can be COOL, ICE, HEAT, or TEST as determined from the Unit Mode setpoint (TEST mode shall not be selectable from the 4x20 display/keypad although it may be displayed if already set).

Source settings can be LOCAL, SWITCHES, or NETWORK as determined from the Mode Source setpoint.

```
SET UNIT SPs (2)
Available Modes
    = COOL/HEAT
```

Available Modes settings can be COOL, COOL/ICE, ICE, COOL/HEAT, or HEAT as determined from the Available Modes setpoint.

```
SET UNIT SPs (3)
Cool LWT =  XX.X°F
Ice  LWT =  XX.X°F
Heat LWT = XXX.X°F
```

The Cool, Ice, and Heat setpoints are only displayed if the corresponding mode is available as specified by the Available Modes setpoint.

```
SET UNIT SPs (4)
Leaving Water Temp.
StartDelta= XX.X°F
StopDelta =  X.X°F
```

StartDelta is the number of degrees above setpoint (below setpoint for Templifiers) for unit to start. StopDelta is the number of degrees below setpoint (above setpoint for Templifiers) for unit to stop.

```
SET UNIT SPs (5)
Reset Type =4-20mA
MaxResetDT =XX.X°F
StrtResetDT=XX.X°F
```

Reset Type settings can be NONE, RETURN (return chilled water), or 4-20 (external input) as determined by the LWT Reset Type setpoint.

```
SET UNIT SPs (6)
Soft Load    = OFF
InitialSLAmp=XXX%
SoftLoadRamp=Xxmin
```

Soft Load settings can be OFF or ON as determined from the Soft Load setpoint. InitialSLAmp is the percent of full load amps that the unit starts to ramp up. SoftLoadRamp is number of minutes (1 to 60) to load from the initial percent amps to 100 percent amps.

```
SET UNIT SPs (7)
Max/Min LWT Rates
  Max = X.X°F/min
  Min = X.X°F/min
```

These setpoints determine the maximum and minimum allowable rate of chilled water temperature change. They may take president over loading rates based on the SoftLoad ramp

```
SET UNIT SPs (8)
EvapRecTmr =X.Xmin
EvapPump = #1 ONLY
CondPump = #2 PRIM
```

Evap and Cond Pump settings can be #1 ONLY, #2 ONLY, #1 PRIM (Primary), #2 PRIM or AUTO as determined from the Evap Pump or Cond Pump setpoints.

```
SET UNIT SPs (9)
Templifier
  SrcNoStart =XX°F
  SourceReset=XX°F
```

These settings only apply to Templifier units. SrcNoStart sets the entering source water temperature below which the unit is prevented from starting. SourceReset sets the source water temperature below which the hot water temperature is reset down as the source water temperature drops.

```
SET UNIT SPs (10)
VFD = Yes
Min Speed = XXX%
Spd/Lift=XXX%/XX°F
```

VFD settings can be NO or YES as determined by the VFD set point.

```
SET UNIT SPs (11)
       CLOCK
    dd/mmm/yyyy
      hh:mm:ss
```

```
SET UNIT SPs (12)
Units = °F/psi
Lang  = ENGLISH
```

Units settings can be °F/psi or °C/kPa as determined by the Display Units setpoint.

Lang (Language) settings can be ENGLISH or (TBD) as determined by the Language setpoint.

```
SET UNIT SPs (13)
Protocol =
Ident Number +
Baud Rate =
```

Set Alarm Setpoints

```
SET ALARM LMTS (1)
LowEvPrHold=XXXpsi
LowEvPrUnld=XXXpsi
LowEvPrStop=XXXpsi
```

```
SET ALARM LMTS (2)
HighCondPr=XXXXpsi
HiDschT-Load=XXX°F
HiDschT-Stop=XXX°F
```

```
SET ALARM LMTS (3)
HiOilFeedTmp=XXX°F
LowOilDeltaT =XX°F
LowNetOilPr=XXXpsi
```

```
SET ALARM LMTS (4)
HighSSH-Start=XX°F
HighSSH-Run  =XX°F
MtrCurrThrshld=XX%
```

```
SET ALARM LMTS (5)
Evap Freeze=XX.X°F
Cond Freeze=XX.X°F
```

Set Tower Setpoints

NOTE: A complete description of the setup for cooling towers is found on page 25.

```
SET TOWER SPs (1)
TowerControl = None
Tower Stages = x
StageUP/DN=XXX/XXX%
```

TowerControl settings can be None, Temp, or Lift. Stages is the number of fans to be controlled, 1 to 4.

Tower Control = Temp/None

```
SET TOWER SPs (2)
Stage ON (Temp)°F
  #1  #2  #3  #4
 XXX XXX XXX XXX
```

Tower Control = Lift

```
SET TOWER SPs (2)
Stage ON (Lift)psi
  #1  #2  #3  #4
 XXX XXX XXX XXX
```

Tower Control=Temp/None

```
SET TOWER SPs (3)
StageDiff = XX.X°F
Stage Up  = XX min
StageDown = XX min
```

Tower Control=Lift(psi)

```
SET TOWER SPs (3)
StageDiff =XX.Xpsi
Stage Up  = XX min
StageDown = XX min
```

Tower Control=Lift(kPa)

```
SET TOWER SPs (3)
StageDiff =XXX kPa
Stage Up  = XX min
StageDown = XX min
```

```
SET TOWER SPs (4)
Valve/VFD Control=
  ValveSP/VFDStage
Valve Type = NC
```

Valve/VFD Control settings are None, Valve Setpoint, Valve Stage, VFD Stage, or ValveSP/VFDStage. Valve Type settings are NC (normally closed to tower) or NO (normally open).

Tower Control = Temp/None

```
SET TOWER SPs (5)
Valve SP = XXX °F
Valve DB = XX.X °F
```

Tower Control = Lift

```
SET TOWER SPs (5)
Valve SP = XXX psi
Valve DB = XXX.Xpsi
```

```
SET TOWER SPs (6)
ValveStartPosition
 Min = XXX% @XXX°F
 Max = XXX% @XXX°F
```

```
SET TOWER SPs (7)
Valve Control Range
   Min = XXX%
   Max = XXX%
```

```
SET TOWER SPs (8)
PD Control Loop
  Error Gain = XX
  Slope Gain = XX
```

Alarms

When an alarm occurs, the alarm type, limit value (if any), date, and time are stored in the active alarm buffer corresponding to that alarm (viewed on the Active Alarm screen) and also in the alarm history buffer (viewed on the Alarm History screen). The active alarm buffers hold a record of the last occurrence of each alarm and whether or not it has been cleared. The alarm can be cleared by pressing the Edit key. A separate buffer is available for each alarm (High Cond Pressure, Evaporator Freeze Protect, etc.). The alarm history buffer holds a chronological account of the last 50 alarms of any type.

Security

Two four-digit passwords provide OPERATOR and MANAGER levels of access to changeable parameters. Either password can be entered using the ENTER PASSWORD screen which can be accessed either through the SET OTHER menu or by simply pressing the ENTER key while on one of the SET screens. The password can then be entered by pressing the ENTER key, scrolling to the correct value with the UP and DOWN arrow keys, and pressing ENTER again. The length of the password shall not be indicated. Once the correct password has been entered, the previously selected screen shall reappear. Once a password has been entered, it will remain valid for 15 minutes after the last key-press. It is possible to change the passwords through pLAN. Parameters and screens that require the MANAGER password will not be displayed unless the MANAGER password is active.
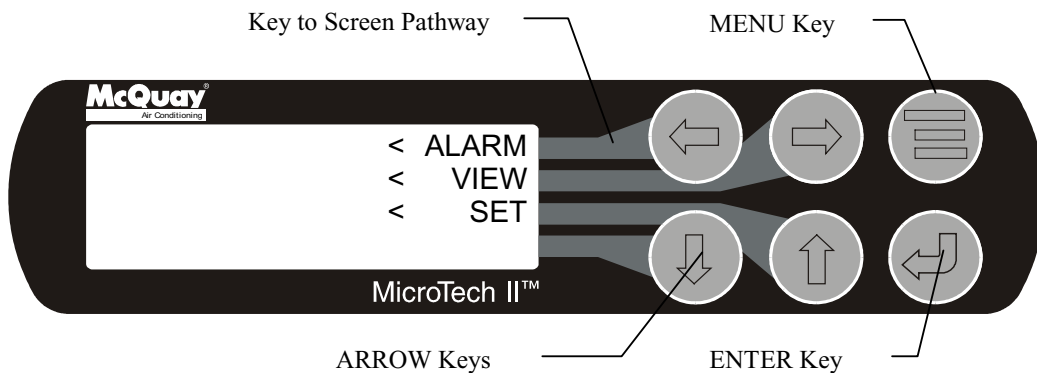
Compressor Controller

A general description of the unit controller with its inputs and outputs is on page 8. This section will describe the operation of the controller, define the screen hierarchy and how to navigate through it and also give a description of the screens.

4x20 Display & Keypad

Layout
The 4-line by 20-character/line liquid crystal display and 6-key keypad are shown below.

Figure 29, Display (in MENU mode) and Keypad Layout

Note that each ARROW key has a pathway to a line in the display. Pressing an ARROW key will activate the associated line <u>when in the MENU mode.</u>

Getting Started
There are two basic procedures to learn in order to utilize the MicroTech II controller:

1. Navigating through the menu matrix to reach a desired menu screen and knowing where a particular screen is located.

2. Knowing what is contained in a menu screen and how to read that information or how to change a setpoint contained in the menu screen.

Navigating

The menus are arranged in a matrix of screens across a top horizontal row. Some of these top-level screens have sub-screens located under them. The general content of each screen and its location in the matrix are shown in Figure 27. A detailed description of each menu screen begins on.

There are two ways to navigate through the menu matrix to reach a desired menu screen.

One is to scroll through the matrix from one screen to another using the four ARROW keys.

The other way is to use shortcuts to work through the matrix hierarchy. From any menu screen, pressing the MENU key will take you to the top level of the hierarchy. The display will show ALARM, VIEW, and SET as shown in Figure 29. One of these groups of screens can then be selected by pressing the key connected to it via the pathway shown in Figure 25.
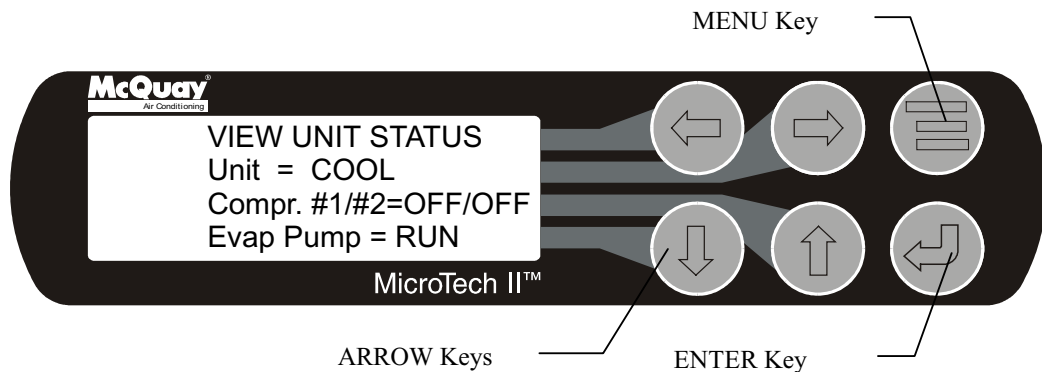
For example, selecting ALARM will go the next row of menus under ALARM (ALARM LOG or ACTIVE ALARM). Selecting VIEW will go the next level of screens under VIEW (VIEW UNIT STATUS or VIEW UNIT TEMP). Selecting SET will go to a series of screens for looking at and changing setpoints.

MENU Key

The MENU key is used to switch between the shortcut method (known as the MENU mode and as shown in Figure 29) and scrolling method (known as the SCROLL mode). The MENU mode is the shortcut to specific groups of menus used for checking ALARMS, for VIEWING information, or to SET setpoint values. The SCROLL mode allows the user to move about the matrix (from one menu to another, one at a time) by using the four ARROW keys.

Pressing the MENU key from any menu screen will automatically return you to the MENU mode as shown in Figure 25.

Figure 30, Display in the Shortcut (SCROLL) Mode and Keypad Layout

Menu Screens

Various menus are shown in the controller display. Each menu screen shows specific information; in some cases menus are used only to *view* the status of the unit, in some cases they are used for checking and clearing *alarms*, and in some case they are used to *set* setpoint values.

The menus are arranged in a matrix of screens across a top horizontal row. Most of these top-level screens have sub-screens located under them. The general content of each screen and its location in the matrix are shown in Figure 27. A detailed description of each menu begins on

The ARROW keys on the controller are used to navigate through the menus. The keys are also used to change numerical setpoint values contained in certain menus.

Compressor Controller Setpoints

Set Compressor Setpoints

NOTE: In the following SET COMP screens, the #N field indicates which compressor (#1, #2, etc.) is being set and is not shown on single compressor units. Screens are shown for compressor #1 only. Screens for compressor #2 for dual compressor units are identical to #1.

Table 22, Compressor Setpoints

Description	Default	Range	PW
Unit (Duplicates)			
Unit Enable	OFF	OFF, ON	O
Unit Mode	COOL	COOL, ICE, HEAT, TEST	O T
Cool LWT	44. 0°F	35.0 to 80.0 °F	O
Ice LWT	25. 0°F	15.0 to 35.0 °F	O
Heat LWT	135. 0°F	100.0 to 150.0 °F	O
Startup Delta T	3.0°F	0.0 to 10.0 °F	O
Shutdown Delta T	3.0°F	0.0 to 3.0 °F	O
VFD			
VFD	No	No, Yes	T
Minimum Speed	70%	60 to 100%	T
Speed @ 0 Lift	50%	0 to 100%	T
Lift @ Max Speed	40 °F	30 to 60 °F	T
Motor Amps			
Demand Limit	OFF	OFF, ON	O
Minimum Amps	40%	20 to 80%	T
Maximum Amps	100%	40 to 100%	T
Soft Load	OFF	OFF, ON	M
Begin Amp Limit	40%	20 to 100%	M
Soft Load Ramp	5 min	1 to 60 min	M
Maximum Rate	0.5 °F/min	0.1 to 5.0 °F/min	M
Minimum Rate	0.1 °F/min	0.0 to 5.0 °F/min	M
Staging			
Mode	Normal	Normal, Efficiency, Pump, Standby	M
Sequence #	1	1,2, … (# of Compressors)	M
Maximum Compressors ON	16	1-16	M
Stage Delta T	1.0	0.5-5.0	M
Full Load	120 sec	30 to 300 sec	T
Timers			
Start-Start	40 min	15 to 60 min	M
Stop-Start	3 min	3 to 20 min	M
Oil			
Oil Feed Temperature	100 °F	90 to 190 °F	T
Oil No Start Diff (above Evap Temp)	40 °F	30 to 60 °F	T
Templifier			
Source No Start	70 °F	50 to 100 °F	T
Alarms			
Evaporator Freeze	34.0 °F	-9.0 to 45.0 °F	T
Condenser Freeze	34.0 °F	-9.0 to 45.0 °F	T
Low Evap Pressure	26 psi	10 to 45 psi	T
Low Evap Pressure-Inhibit	38 psi	20 to 45 psi	T
Low Evap Pressure-Unload	31 psi	20 to 45 psi	T
High Discharge Temperature-Shutdown	190 °F	120 to 240 °F	T
High Discharge Temperature-Load	170 °F	120 to 240 °F	T
High Condenser Pressure	140 psi	120 to 240 psi	T
Motor Current Threshold	10%	1 to 20%	T
High Oil Feed Temperature	140 °F	120 to 240 °F	T
Low Oil Delta Temperature	30 °F	20 to 80 °F	T
Low Net Oil Pressure	40 psi	30 to 60 psi	T
Surge High Suction SH - Start	50 °F	25 to 90 °F	T
Surge High Suction SH - Run	25 °F	5 to 45 °F	T
Service			
Vane Mode	AUTO	AUTO, MANUAL	T
VFD Mode	AUTO	AUTO, MANUAL	T
Hot Gas Bypass	30%	20 to 70%	T
Unload Timer	30 sec	10 to 240 sec	T
Postlube Timer	30 sec	10 to 240 sec	T

```
SET COMP#N SPs (1)
Demand Limit = OFF
Minimum Amps =XXX%
Maximum Amps =XXX%
```

Demand Limit settings can be OFF or ON as determined from the Demand Limit setpoint.

```
SET COMP#N SPs (2)
StageMode = NORMAL
StageSequence# =XX
Max Comprs ON = XX
```

StageMode settings can be NORMAL, HI EFF, PUMP, and STANDBY as determined by the Stage Mode setpoint. NORMAL is the auto balance sequence starting compressors with least starts and stopping with most hours, in sequence. HI EFF is used with multiple dual compressor chillers and runs one compressor per chiller when ever possible. PUMP starts all compressors on the same chiller first starting with the chiller with the compressor with the least starts. STANDBY is used in multi-compressor systems and reserves a compressor to come on only if there is a failure of another compressor in the system and the standby compressor capacity is required to maintain chilled water temperature.

StageSequence is set for each compressor:

In NORMAL or STANDBY Mode, all compressors can have the same number or a number from 1 up to the total number of compressors. Sequence number has priority over other considerations. If four compressors in a system are given the sequence numbers 1 through 4, they will always start in that order. With the same number they will auto-sequence.

In HI EFF or PUMP, all compressors must have the same sequence number.

Max Comprs ON limits the number of compressors allowed to run in multi-compressor systems. It provides a "floating standby" compressor. All compressor controllers must have the same setting for this setpoint.

```
SET COMP#N SPs (3)
StageDeltaT= X.X°F
Stop-Start = xx min.
Start-Start =xx min.
```

```
SET COMP#N SPs (4)
Full Load = XXX sec
```

```
SET COMP#N SPs (5)
OilNoStrtDiff=XX°F
Abs Capacity=XXXXT
HotGasBypass = XX%
```

```
SET COMP#N SPs (6)
UnloadTimer=XXXsec
PrelubeTmr=xxxsec
PostlubeTmr=XXXsec
```

Before Entering Edit Mode   **After Entering Edit Mode**

```
SET COMP#N (7)        SET COMP#N (7)
VaneMode=AUTO         VaneMode=AUTO   <AUTO
Vanes=UNKNOWN         Vanes=UNKNOWN   <LOAD
%RLA = XXX%           %RLA = XXX%     <UNLD
```

VaneMode settings can be AUTO or MAN (Manual) as determined from the Vane Mode setpoint. Vanes position is indicated as CLOSED or UNKNOWN as determined from the Vanes Closed switch digital input. When Edit mode is selected on this screen, the <AUTO/<LOAD/<UNLD prompts will appear. Holding the "LOAD" key will then continuously load the compressor and holding the "UNLD" key will unload it. After releasing either key the compressor will "hold" and the Vane Mode setpoint will be set to Manual. Pressing the AUTO" key will set the Vane Mode back to Auto. After leaving edit mode the <AUTO/<LOAD/<UNLD prompts will be hidden.

The following VFD screen will only be shown if the VFD set point = YES.

Before Entering Edit Mode   **After Entering Edit Mode**

```
SET COMP#N (8)        SET COMP#N (8)
VFD Mode=AUTO         VFD Mode=AUTO   <AUTO
VFD  = XXX%           VFD  = XXX%     <LOAD
%RLA = XXX%           %RLA = XXX%     <UNLD
```

VFD Mode settings can be AUTO or MAN (Manual) as determined from the VFD Mode setpoint. VFD speed is shown as 0 to 100%. When Edit mode is selected on this screen, the <AUTO/<LOAD/<UNLD prompts will appear. Holding the "LOAD" key will then continuously speed up the VFD and holding the "UNLD" key will slow it down. After releasing either key the VFD will stay at the current speed and the VFD Mode setpoint will be set to Manual. Pressing the AUTO" key will set the VFD Mode back to Auto. After leaving edit mode the <AUTO/<LOAD/<UNLD prompts will be hidden.

Staging Parameters

Full Load Determination
Each compressor determines if it is at its maximum capacity (or maximum allowed capacity) and, if so, set its Full Load flag. The flag shall be set (full load) when one or more of the following conditions are met.

- The compressor is at its physical limit of capacity which means:

  For VFD Set Point = NO: The load output has been pulsed ON for a cummulative time equal to or greater than the Full Load set point. Any unload pulse shall reset the cummulative time to zero. The cummulative time must be limited (to a value above the maximum allowed setting of the Full Load set point) so that no wrap occurs.

  For VFD Set Point = YES: Load pulsing has exceeded the Full Load set point (as described above) AND the VFD speed = 100%

OR
The Vanes Open digital input is On AND the VFD speed = 100%.
- The %RLA is above or equals the Maximum Amp limit set point.
- The %RLA is above or equals the Demand Limit analog input value
- The %RLA is above or equals the Network Limit value
- The evaporator pressure is below the Low Evap Pressure-Inhibit set point.

When none of the above conditions are met, the Full Load flag shall be cleared.

Absolute Capacity

Each compressor shall estimate its absolute capacity from the present value of %RLA and the Absolute Capacity set point from the equation:

Absolute Capacity = (%RLA Factor) * (Absolute Capacity set point)

Where the %RLA Factor is interpolated from the following table.

%RLA	0	50	75	100	150
%RLA Factor	0	0.35	0.75	1.00	1.50

Multiple Compressor Staging

- This section defines which compressor is the next one to start or stop. The next section defines when the start, or stop, is to occur.

Functions

- Can start/stop compressors according to an operator defined sequence.

- Can start compressors based on # of starts (run hours if starts are equal) and stop on run hours

- The above two modes can be combined so that there are two or more groups where all compressors in the first group are started (based on number of starts/hours) before any in the second group, etc. Conversely, all compressors in a group are stopped (based on run hours) before any in the preceding group, etc.

- An "efficiency priority" mode can be selected for two or more chillers where one compressor is started on each chiller in the group before a second is started on any of them.

- A "pump priority" mode can be selected for one or more chillers where all compressors on a given chiller are started before going to the next chiller in the group.

- One or more compressor can be defined as "standby" where it is never used unless one of the normal compressors is unavailable.

Operating the Chiller Control System

Interface Panel On/Off

The Operator Interface Panel is turned on and off with a push-push switch located at the upper-left corner on the rear of the panel. ON is the outermost switch position and a white band will be visible on the switch stem. Off is innermost and no white is visible.

The screen is equipped with a screen saver that blackens the screen. Touching it anywhere reactivates the screen. If the screen is black, touch it first to be sure it is on before using the ON/OFF switch.

Start/Stop Unit

There are four ways to start/stop the chiller. Three are selected in SETPOINT\ MODE\SP3, the fourth way is through panel-mounted switches:

Operator Interface Panel (LOCAL)
Home Screen 1 has AUTO and STOP buttons that are only active when the unit is in "LOCAL CONTROL". This prevents the unit from being accidentally started or stopped when it is under control from a remote switch or BAS. When these buttons are pressed, the unit will cycle through its normal starting or stopping sequence. On dual compressor units, both compressors will be stopped and normal dual compressor starting procedure will be in effect.

Remote SWITCH
Selecting SWITCH in SP3 will put the unit under the control of a remote switch that must be wired into the control panel (see Figure 2 on page 10).

BAS
BAS input is field-wired into a card that is factory-installed on the unit controller.

Control Panel Switches
The unit control panel, located adjacent to the Interface Panel has switches inside the panel for stopping the unit and compressors. When the UNIT switch is placed in the OFF position the chiller will shut down through the normal shutdown sequence whether one or two compressors.

The COMPRESSOR switch(s) (two on dual compressor units) will immediately shut down the compressor without going through the shutdown sequence when placed in the OFF position. It is equivalent to an emergency stop switch.

Change Setpoints

Set points are easily changed on the Operator Interface Touch Screen (OITS). A complete description of the procedure begins on page 20. Set points can also be changed in the unit controller but this is not recommended except in an emergency when the OITS is unavailable.

Alarms

A red ALARM light in the lower middle of any screen is illuminated if there is an alarm. If the optional remote alarm is wired in, it too will be energized.

There are three types of alarms:

- FAULT, equipment protection alarms that shut a unit or compressor off.

- Problem, limit alarms that limit compressor loading in response to an out-of-normal condition. If the condition that caused a limit alarm is corrected, the alarm light will be cleared automatically.

- Warning, notification only, no action taken by controller.

Any type will light the ALARM light. Procedures for dealing with alarms are shown below:

1. Press the alarm light button. This will go directly to the ACTIVE ALARMS screen.

2. The alarm description (with date stamp) will be shown.

3. Press the ACKNOWLEDGE button to recognize the alarm.

4. Correct the condition causing the alarm.

5. Press the CLEAR button to clear the alarm from the controller. If the fault condition is not fixed, the alarm will continue to be on and the unit will not be able to be restarted.

Component Failure

Chiller Operation without the Operator Interface Panel

The Interface Panel communicates with the unit and compressor controllers, displaying data and transmitting touch screen inputs to the controllers. It does no actual controlling and the chiller can operate without it. Should the Touch Screen become inoperable, no commands are necessary for continuing unit operation. The unit controller can be used to view operational data and to change setpoints if necessary.

Chiller Operation without the Unit Controller

The Touch Screen receives most of its operational data from the unit controller and if the unit controller is not operational considerable data will be absent from the screen. Tower control of fans and/or bypass valve will be disabled and tower operation will be interrupted and require manual intervention to continue operation.

Trend Data

- Set up
- View
- Archive

Tower Control

- Set up fan staging
- Set up tower bypass valve
- Set up fan VFD

Pump Control

- Set up
- View

VFD Set up