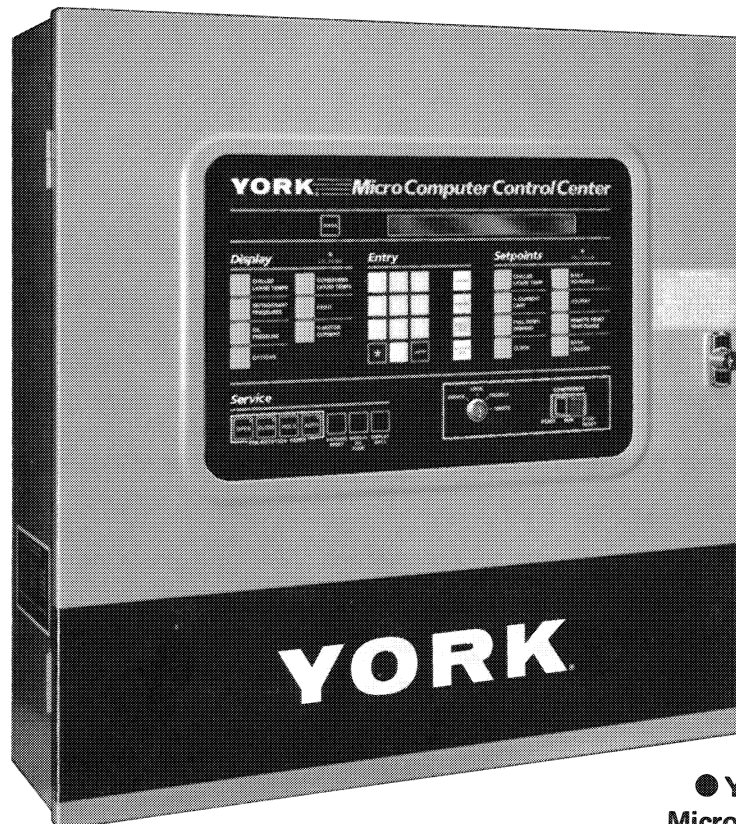


MICROCOMPUTER CONTROL CENTER
Part No. 031-00846
for
MODEL YTA1A1B1 THRU YTL6X6F2
and
MODEL YTA1A1B1 THRU YTL3X3E2
FACTORY PACKAGED TURBO-MODULATOR SYSTEM
COOLING AND HEAT RECOVERY UNITS
150 THRU 1000 TONS



● YORK
MicroComputer
Control Center

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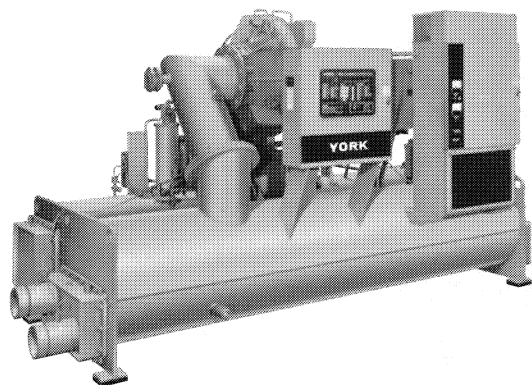
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WARNING

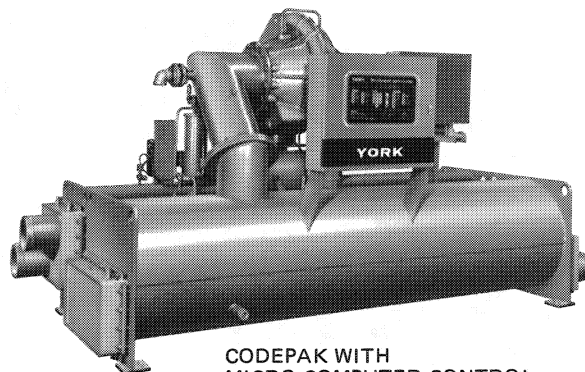
This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for class A computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever may be required to correct the interference.

Additionally, any electronic equipment can generate EMI (electromagnetic interference) which, depending upon the installation and magnitude, may affect other electronic equipment. The amount of EMI generated is determined by the source inductance, load inductance, and circuit impedances. Responsibility for assuring the satisfactory operation of other equipment included in the same power source as the York equipment rests solely with the user. YORK disclaims any liability resulting from any interference or for the correction thereof.

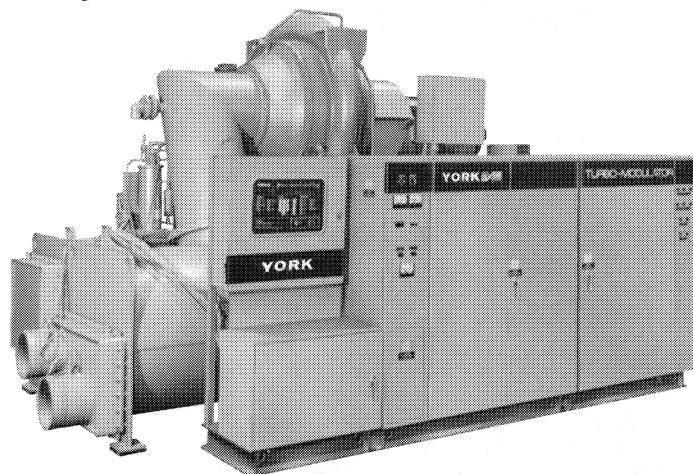
INSTALLATION



CODEPAK WITH
MICRO-COMPUTER CONTROL
CENTER & SOLID STATE STARTER



CODEPAK WITH
MICRO-COMPUTER CONTROL
CENTER FOR REMOTE ELECTRO-
MECHANICAL STARTER
APPLICATION



CODEPAK WITH
TURBO-MODULATOR
& MICRO-COMPUTER
CONTROL CENTER

FIG. 1 - CODEPAK CHILLERS WITH MICRO COMPUTER CENTER SHOWN WITH SOLID STATE STARTER, SHOWN FOR ELECTRO-MECHANICAL STARTER APPLICATIONS AND TURBO-MODULATOR APPLICATION.

INTRODUCTION:

The York MicroComputer Control Center is designed specifically for use with Model YT R-11, Single Stage Centrifugal Liquid Chillers. This control center provides all (except system mounted devices) safety and operating controls for automatic operation of one (1) unit.

MOUNTING AND MECHANICAL CONNECTIONS:

Control centers are factory mounted, See Fig. 1, piped and wired to Codepak, or shipped separately (Form 3 or 4 shipment) for field installation.

When field installed the control center should be mounted on the unit with the mounting brackets and hardware provided for that purpose. The control center weight is approximately 85 lbs.

Factory control wiring from the Control Center consists of the following:

STANDARD CONNECTIONS (Electro-Mechanical Starter & Solid State Starter)

1. Wire Harness for Leaving Chilled Water Resistance temperature sensor RS1)
2. Wiring Harness for entering chilled water resistance temperature sensor (RS9), oil pressure transducer-input (oil filter discharge), evaporator pressure transducer-input, condenser pressure transducer-input, purge pressure transducer input, oil pressure transducer-input (PRV-Input point) for high discharge temperature sensor (RS2), high oil temperature sensor (RS3) and wiring from current transformers - CT1, CT2, CT3, CT4.
3. Wiring harness to the main junction box located on the top of the condenser.

ADDITIONAL CONNECTIONS - Solid State Starter.

4. Power wiring harness to Solid State Starter Control Transformer.
5. Wiring harness to solid State Starter Controls.

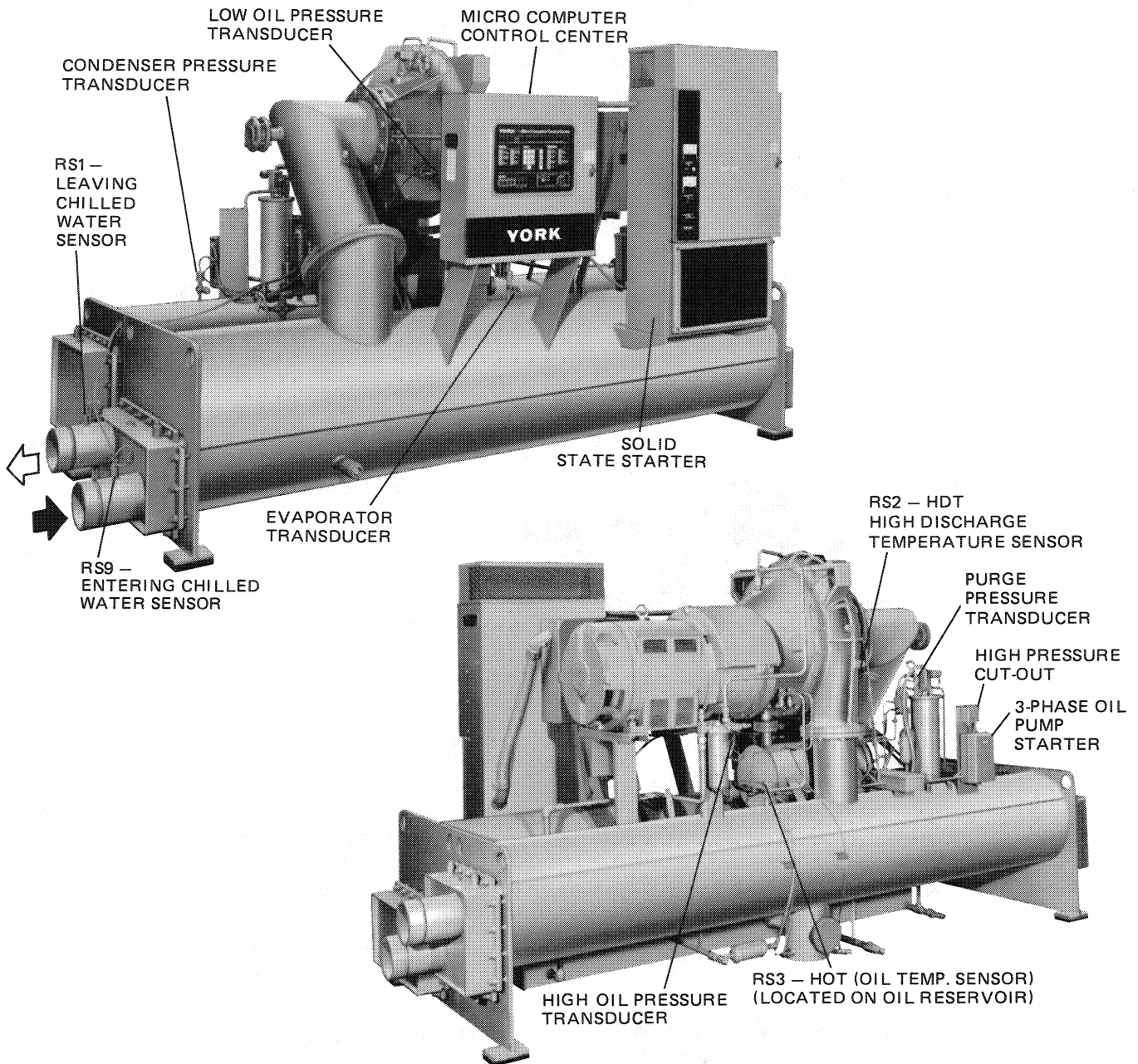
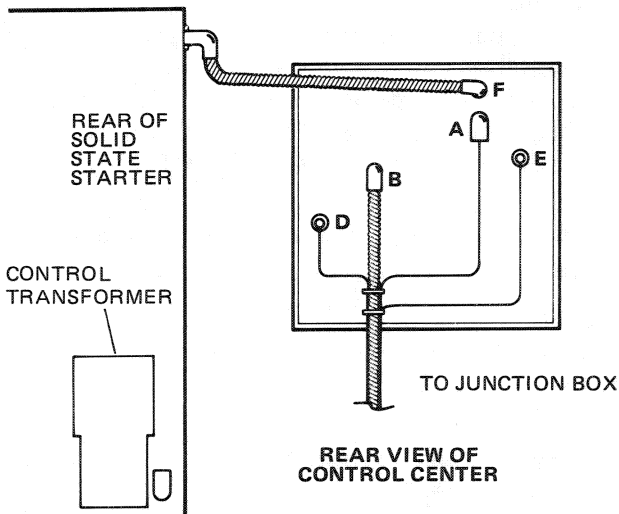


FIG. 2 — MODEL YT CODEPAK SHOWING LOCATION OF RESISTANCE TEMPERATURE SENSORS.



- A — FROM CURRENT TRANSFORMER (CT1) IN MOTOR TERMINAL BOX.
 - B — FROM UNIT JUNCTION BOX.
 - D — FROM: ENTERING CHILLED WATER SENSOR (RS9)
DISCHARGE TEMP. SENSOR (RS2)
OIL TEMP. (RS3)
TRANSDUCERS;
 - E — FROM LEAVING CHILLED WATER SENSOR (RS1)
 - F — FROM SOLID STATE STARTER (1TB) TERMINAL BLOCK & J1 PLUG.
- HIGH OIL PRESS.
LOW OIL PRESS.
EVAP. PRESS.
CONDENSER PRESS.
PURGE PRESS.

FIG. 3 — CONTROL CENTER CONNECTIONS MICRO COMPUTER CENTER WITH SOLID STATE STARTER.

Solid State Starter

Control Center Wiring Diagram - Form 160.45-PA2.6
Field Wiring Connections Diagram - Form 160.45-PA3.6

A chilled water flow switch must be installed between terminals per the respective field wiring diagrams.

Electro-Mechanical Starter

Control Center Wiring Diagram - Form 160.45-PA2.7
Field Wiring Connections Diagram - Form 160.45-PA3.7

The control circuit supply for one unit is 115 VAC, 15 AMPS or 1.5 KVA 50/60 Hertz. A chilled water flow switch must be installed between terminals per the respective field wiring diagrams.

Turbo-Modulator

Control Center Wiring Diagram - Form 160.45-PA2.10
Field Wiring Connections Diagram - Form 160.45-PA3.8

All wiring should be done in accordance with the National Electrical Code (NEC) and all other applicable local codes and/or specifications.

A chilled water flow switch must be installed between terminals per the respective field wiring diagrams.

The condenser water pump starter must also have a 115 volt separate control circuit in order to connect it as recommended.

FIELD WIRING MODIFICATIONS

The recommended wiring modifications to the Micro Computer Control Center when required for a particular application may be made. They are shown in the "Field Control Modifications" diagrams. (See Form 160.45-PA4.5)

Form 160.45-PA4.5 includes the following modifications:

1. Energy Management Systems
2. Remote Mode Ready to Start Contact (Fig. A)
3. Cycling Shutdown Contacts (Fig. B)
4. Safety Shutdown Contacts (Fig. C)
5. Run Contacts (Fig. D)

* The auto/restart jumper plug is shipped in a small cloth bag that is tied inside the micro computer control center.

6. Remote Start-Stop Contacts from Energy Management System (Fig. E)
7. Remote/Local Cycling Devices (Fig. F)
8. Multi-Unit Sequence (Fig. G)
9. Condenser Water Flow Interlock (Fig. H)
10. Two Unit Sequence Control (Kit) (Fig. J) (Optional)
11. Multiple Units (two) - Series Operation (Fig. K)
12. Multiple Units (two) - Parallel Operation - Individual Pumps (Fig. L)
13. Multiple Units (two) - Parallel Operation - Single Chilled Water Pump (Fig. M)
14. Electro-Mechanical Starter Manual Reset Overloads (Fig. N) (2300 to 4160 volts U.L. or C.S.A. approved units only)
15. Remote Leaving Chilled Water Temperature Setpoint with Pulse Width Modulated Signal (Fig. P)
16. Remote Current Limit Setpoint with Pulse Width Modulated Signal (Fig. Q)
- *17. Micro Board Jumpers for Auto/Manual Restart After Power Failure or English/Metric Display Units (Fig. R)
18. Condenser Water Temperature Sensors (Optional kit) (Fig. S)
19. Teleguard Service Monitor (Fig. T)
20. Card File (Fig. U)
21. Remote Current Limit Setpoint - Option Card #1 (Fig. V)
22. Remote Leaving Chilled Water Temperature Setpoint Option Card #2 (Fig. W)
23. Remote Start-Stop Pushbutton Station (Fig. X)
24. External Signal for Refrigeration Unit Failure (Fig. Y)
25. Relay Auxiliary Contacts for External Signal (Fig. Z)
26. Run Contacts/Remote Run Light and Shutdown Indicator Plus EMS (Fig. AA)

If the Codepak is not equipped with a York Solid State Starter or a Turbo-Modulator check the compressor electro-mechanical remote motor starter to determine that it is per York Standard R-1051 shown in Form 160.45-PA5.1. It should generally have: 115 volt separate control; 15 amp or 1.5 KVA source.

YORK CODEPAK MICROCOMPUTER CONTROL CENTER

THEORY OF OPERATION

INTRODUCTION

The York MicroComputer Control Center is a microprocessor based control system for R-11 centrifugal chillers. It controls the leaving chilled water temperature via pre-rotation vane control and has the ability to limit motor current via control of the pre-rotation vanes. Further, it is compatible with York solid state starter, electro-mechanical starter and Turbo-Modulator applications.

A tactile touch key pad mounted on the front of the control center (see Fig. 7) allows the operator to display system operating parameters on a 40 character alphanumeric display that is part of the key pad. These readings are displayed via "Display" key pad as follows: (In the English mode; temperatures in °F pressures in PSIA) (in the metric mode, temperatures in °C, Pressures in KPa)

- CHILLED LIQUID TEMPERATURES - LEAVING AND RETURN
- REFRIGERANT PRESSURES - EVAPORATOR AND CONDENSER
- DIFFERENTIAL OIL PRESSURE
- CONDENSER LIQUID TEMPERATURES - OPTIONAL FIELD INSTALLED - LEAVING AND RETURN
- OPTIONS
- PRINT
- MOTOR CURRENT IN % OF FULL LOAD AMPS
- SATURATION TEMPERATURES - EVAPORATOR AND CONDENSER
- DISCHARGE TEMPERATURE
- OIL TEMPERATURE
- PURGE PRESSURE

The system setpoints (see Fig. 7) are operator entered on the front Control Center "setpoints" key pad. These setpoints can also be displayed on the 40 character alphanumeric display. The system setpoints are:

- CHILLED LIQUID TEMPERATURE (LCWT)
- % CURRENT LIMIT
- PULLDOWN DEMAND LIMIT
- CLOCK (TIME-OF-DAY)
- DAILY SCHEDULE (7 DAY TIME-CLOCK PROGRAMMING)
- HOLIDAY
- REMOTE RESET TEMPERATURE RANGE
- DATA LOGGER

The cause of all system shutdowns (safety or cycling) is preserved (until the system is reset or restarts) in the MicroComputer's memory for subsequent viewing on the key pad display. The operator is continually advised of system operating conditions by various background and warning messages. The key pad contains special service keys for use by the serviceman when performing system troubleshooting.

The MicroComputer Control Center is designed to be compatible with most energy management systems (EMS) in use today. The standard design allows for the following EMS interface:

1. Remote Start
2. Remote Stop
3. Remote LCWT Setpoint (Pulse Width Modulated signal)
4. Remote Current Limit Setpoint (Pulse Width Modulated signal)
5. A "Remote Mode Ready to Start" Status Contacts
6. Safety Shutdown Status Contacts
7. Cycling Shutdown Status Contacts
8. Run Contacts

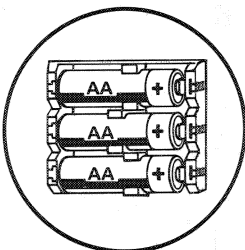
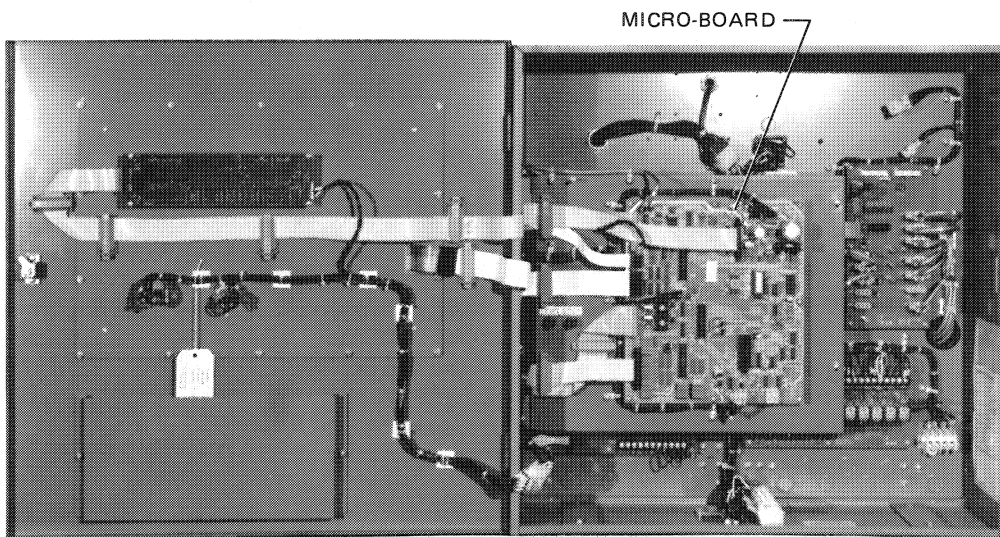
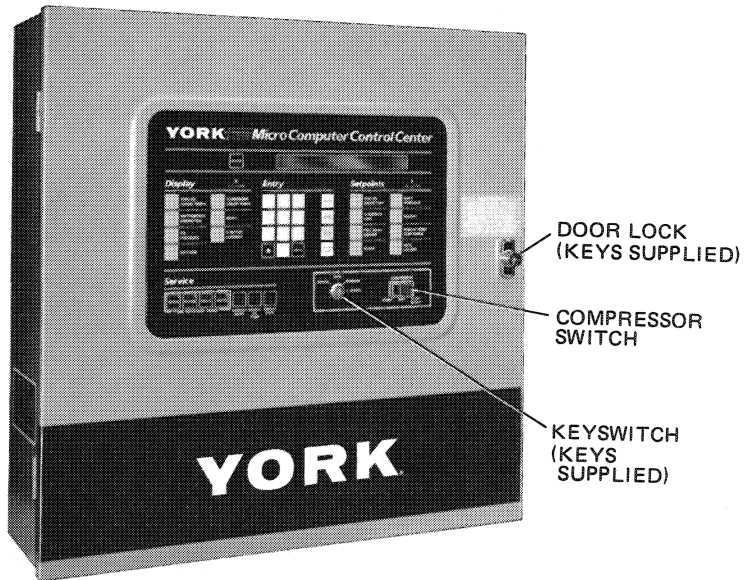
As an enhancement to the standard EMS features, an optional card file with plug-in printed circuit boards is available. These optional cards will accept a remote LCWT 0 to 10°F or 0 to 20°F setpoint offset and/or remote current limit setpoint interface from three user input choices:

1. 4-20 mA
2. 0-10 Vdc
3. contact closures

SYSTEM DESCRIPTION

Micro-Board

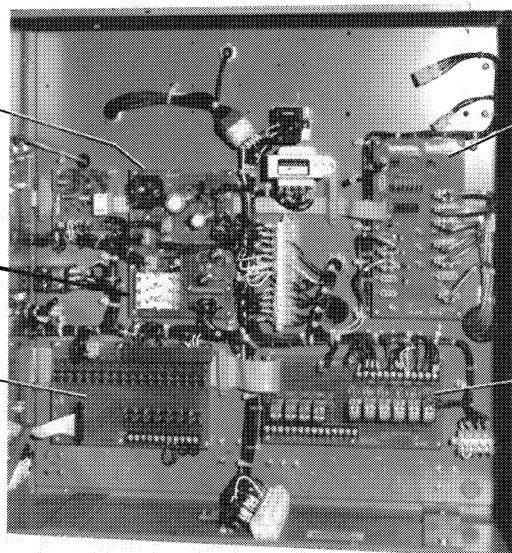
The microprocessor and supporting digital logic circuits are contained on a single printed circuit *micro board*. All



IMPORTANT:
 INSTALL 3-AA ALKALINE BATERIES
 IN THIS LOCATION ON POWER SUPPLY
 BOARD (BATTERIES MUST BE INSTALLED
 TO MAINTAIN THE PROGRAM WHEN
 POWER IS TURNED OFF.

POWER
 SUPPLY
 BOARD

DIGITAL
 INPUT
 BOARD



ANALOG
 INPUT
 BOARD

RELAY
 OUTPUT
 BOARD

FIG. 6 - MICRO COMPUTER CONTROL CENTER.

system operating decisions except motor overloads, oil pump maintain, high condenser pressure shutdown, or manual compressor shutdown are made by this components such as:

1. Operation of the open or close the vanes (except with Turbo-Modulator application);
2. Operation purge of oil, purge air, and vent line solenoids;
3. Operation to run the oil pump;
4. Operation of the compressor motor starter on safety controls, etc..

All system inputs and outputs must pass through the Micro Board. (A positive manual compressor shutdown is directly controlled via the compressor START-RUN STOP/RESET switch independent of the Micro Board). However, since the micro's digital logic is +5 VDC or +12 VDC, the 115 VAC inputs must be signal conditioned prior to application to the micro board. Similarly, the +12 VDC outputs must be relay isolated in order to drive the system 115 VAC relays and solenoids. These functions are performed by the digital input board and relay output board respectively.

Digital Input Board

The digital input board accepts 115 VAC inputs from chiller relay contacts and external devices such as chilled water pump interlocks, local/remote cycling devices, EMS, purge float switches and vane motor switch, key switch, compressor, etc. These 0 VAC/115 VAC input signals are converted to 0 VDC/+5 VDC logic level signals for use by the micro board. The output of the digital input board is interfaced directly to the micro board.

Relay Output Board

The micro board output interfaces directly to the relay output board. The common side of all relays on the relay board is connected to +12 VDC unregulated. The open collector outputs of the micro board energize or de-energize DC relays on the relay output board by grounding the circuit to the relay coil. The contacts of these relays energize or de-energize the system 115 VAC solenoids and relays. Also, the EMS remote status contacts are located on this board:

1. Remote Mode Ready To Start;
2. Safety Shutdown;
3. Cycling Shutdown;
4. RUN.

Analog Input Board

System pressures are sensed by pressure transducers. System temperatures are sensed by the thermistors. The transducers and thermistors voltages are input to the analog input board where these analog signals are serially transmitted (multiplexed) to the micro board.

On the micro board these analog signals are converted to digital words for providing readouts, performing calculations and for comparison to stored safety threshold values. If these pressures or temperatures exceed the stored threshold values, the micro board would shutdown the system. The leaving chilled water temperature (LCWT) input thermistor interfaces directly to the micro board where this analog signal is converted to a digital word for subsequent use in LCWT control.

Electro-Mechanical Starter

In electro-mechanical starter applications, the control center performs both LCWT and single phase current limit control functions. A CM-1A current module is provided to perform the compressor motor solid state overload function. Further, the CM-1A also provides 3 phase 100% and 104% FLA current limit and power fault protection for compressor motor.

Solid State Starter

In solid state starter applications, the control center performs both LCWT and single phase current limit control functions. The solid state starter performs the compressor motor solid state overload function and also 3 phase 100% and 104% FLA current limit and power fault control for the compressor motor.

Turbo-Modulator

When the control center is used with Turbo-Modulator applications, it does not perform either LCWT control nor current limit control functions. These functions are performed by the Turbo-Modulator. However, the set-points for both of these functions are entered at the microcomputer control center key pad. An interface between the control center and Turbo-Modulator is factory supplied. Two fiber-optic cables interface from the control center to the fiber-optic interface board in the Turbo-Modulator logic section. The fiber-optic interface board conditions the fiber-optic signals to provide an analog LCWT and current limit setpoint to the Turbo-Modulator capacity board.

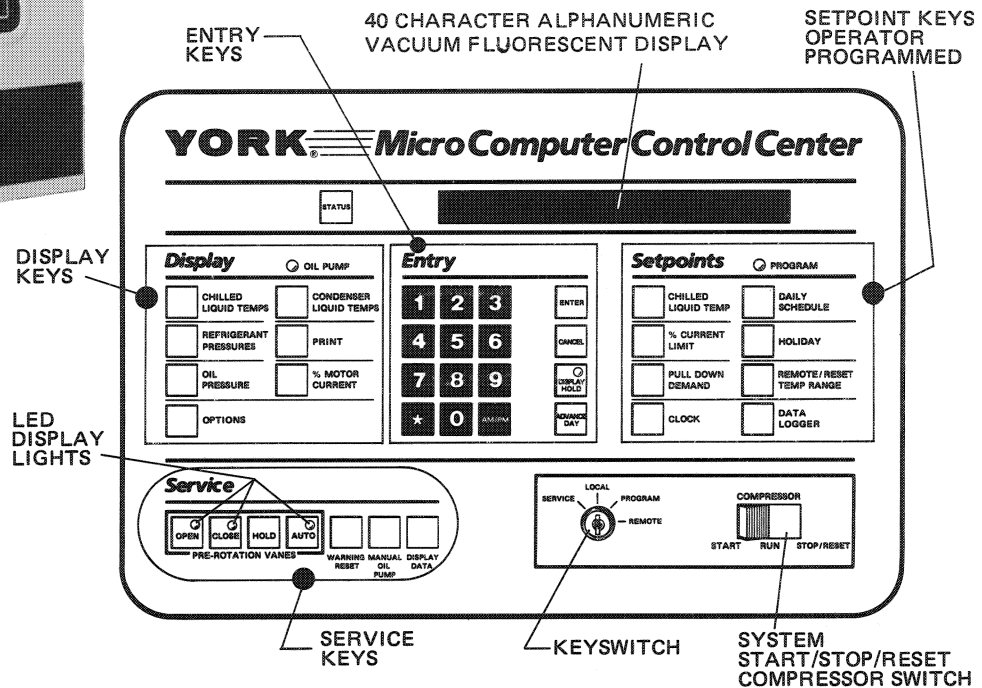
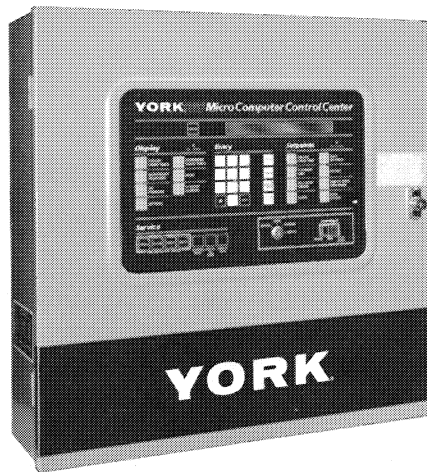


FIG. 7 - KEYPAD

CONTROL CENTER OPERATION

The control center front panel layout consists of four key groups, two switches, and a 1 line by 40 character alphanumeric vacuum fluorescent display: (See Fig. 7.)

CHARACTER DISPLAY - The alphanumeric vacuum fluorescent display is located to the right of the "STATUS" key. All messages, parameters, set points, and data can be viewed at this location. The main communications between the operator or service technician and the micro computer control center occurs on this display.

DISPLAY - Provide a direct read out of each monitored parameter on the alphanumeric display.

ENTRY - These keys are used to enter the values for the operator programmed setpoints. These keys are used in conjunction with the **SETPOINT** keys with the keyswitch in program mode.

SETPOINTS - These keys are used as follows:

1. To view each setpoint, in any keyswitch position, or

2. To select the individual setpoints that are programmed by the operator in Program keyswitch position only.

Pressing the appropriate key enables the operator to program that setpoint pressing the **ENTRY** keys.

SERVICE - Included in this group of keys are those functions that are only relevant to servicing the chiller. Typically, these keys would not be used for daily chiller operation.

KEYSWITCH - This 4-position cylinder lock switch selects the control center mode of operation. The four modes of operation are as follows:

1. **Service** - allows manual PRV control with visual L.E.D. indication of PRV operation.
2. **Local** - allows manual compressor start from the "COMPRESSOR" switch on control center front.
3. **Program** - allows operator programming of system setpoints.
4. **Remote** - allows remote start, remote stop of compressor and remote reset of LCWT and % current limit.

Key is removable only in Local and Remote keyswitch positions.

COMPRESSOR START, RUN, STOP/RESET SWITCH - This 3-position rocker switch is used to start (except in remote mode), stop/run/reset the system.

DISPLAYING SYSTEM PARAMETERS

The **DISPLAY** keys are used to display selected monitored parameters as follows: (Refer to Fig. 7.)

- Press and release the appropriate **DISPLAY** key - the message will be displayed for 2 seconds.

—or—

- Press and hold the appropriate **DISPLAY** key - the message will be displayed and updated every 0.5 seconds until the display key is released.

—or—

- Press and release appropriate **DISPLAY** key, then press and release the **DISPLAY HOLD** key - the message will be displayed and updated every 2 seconds until the **DISPLAY HOLD** key is again pressed and released or 10 minutes have elapsed; whichever comes first.

*NOTE: If the display actually displays X's then the monitored parameter is out of normal operating range (Ref Fig. 8.) If the "English/Metric" Jumper is installed on the Micro Board, all temperatures are displayed in Degrees Fahrenheit (°F) and all pressures are displayed in pounds per sq. inch absolute (PSIA). If the "English/Metric" Jumper is not installed, all temperatures are displayed in Degrees Centigrade (°C) and all pressures are displayed in Kilo-Pascals (KPa).

SYSTEM PARAMETERS OUT-OF-RANGE READINGS

		DISPLAY READS
CONDENSER PRESSURE	= < 8 PSIA	XX.X PSIA
EVAPORATOR PRESSURE	= < 4 PSIA	XX.X PSIA
PURGE PRESSURE	= < .3 PSIA	XX.X PSIA
DISCHARGE TEMP.	= < 71.5°F; > 230°F	XXX.X°F
OIL TEMP.	= < 71.5°F; > 230°F	XXX.X°F
LEAVING CONDENSER WATER TEMP.	= < 8.5°F; > 113.5°F	XXX.X °F
ENTERING CONDENSER WATER TEMP.	= < 8.5°F; > 113.5°F	XXX.X°F
LEAVING EVAPORATOR WATER TEMP.	= < 0°F > 76°F	XX.X°F XX.X°F
ENTERING EVAPORATOR WATER TEMP.	= < 0°F > 86°F	XX.X°F XX.X°F

FIG. 8 - SYSTEM PARAMETERS - OUT OF RANGE READINGS

To Display CHILLED LIQUID TEMPERATURES:

Press **CHILLED LIQUID TEMPS** display key as described above to produce the following alphanumeric display message:

CHILLED LEAVING = XX.X °F, RETURN = XX.X °F

To Display REFRIGERANT PRESSURE:

Use **REFRIGERANT PRESSURE** display key as described above to produce the following alphanumeric display message:

EVAP = XX.X PSIA, COND = XX.X PSIA

To Display OIL PRESSURE:

Use **OIL PRESSURE** display key as described above to produce the following alphanumeric display message:

OIL PRESSURE = XX.X PSID

To Display OPTIONS:

Reserved for future "TELEGUARD" function use of key will produce the following display message:

OPTIONS

To Display CONDENSER LIQUID TEMPERATURES (FIELD INSTALLED OPTION PACKAGE):

Use **CONDENSER LIQUID TEMPS** display key as described above to produce the following alphanumeric display message:

COND LEAVING = XXX.X °F, RETURN = XXX.X °F

To Display PRINT:

Initiates a manual print buffer dump which portrays present run conditions, or run conditions existing prior to coastdown or power failure. The message displayed is:

PRINT ENABLE

To Display MOTOR CURRENT:

Press the % **MOTOR CURRENT** display key as described above to display motor current as a percent of Full Load AMPS. The message is as follows:

MOTOR CURRENT = XXX% FLA

SYSTEM SETPOINTS

The system setpoints may be programmed by the system operator. The "Setpoints" are located on the control center key pad (See Fig. 7.) To program see "Programming System Setpoints" page 14. The following is a

description of these setpoints (with the English jumper installed on the Micro Board):

CHILLED LIQUID TEMP - This key when pressed displays the leaving chilled water temperature (LCWT) setpoint in degrees Fahrenheit. If not programmed, the default value is 45 °F. (See Programming System Setpoints page 14)

*NOTE: If an Energy Management System (EMS) is interfaced to the Control Center for the purpose of **REMOTE LCWT SETPOINT RESET**, then the operator programmed **CHILLED LIQUID TEMP** will be the base or lowest setpoint available to the EMS. This **CHILLED LIQUID TEMP** value must also be entered into the EMS. Further, any subsequent change to this value must also be entered into the EMS.

% CURRENT LIMIT - This key when pressed displays the maximum value of motor current permitted by its programmed setting. The value is in terms of percent of Full Load AMPS (FLA). If not programmed, the default value is 100%. (see Programming Systems Setpoints page 15.)

PULL DOWN DEMAND - This function is used to provide energy savings following the Codepak start-up. This key when pressed displays a programmable motor current limit and a programmable period of time. Operation is as follows: Whenever the system starts, the Pull Down Demand Limit is maintained for as long as the programmed time, then the current limit control returns to % current limit setpoint. The maximum permitted motor current is in terms of percent of Full Load AMPS (% FLA). The duration of time that the current is limited is in terms of minutes (to a maximum of 255). If not programmed, the default value is 100% FLA for 00 minutes. (See Programming Systems Setpoints page 15.) Thus no pull down demand limit is imposed following system start and the % Current Limit Setpoint is used.

CLOCK - This key when pressed displays the day of the week and time of day. If not programmed, the default value is Sunday 12:00 AM (midnight). (See Programming System Setpoint page 15.)

DAILY SCHEDULE - This key when pressed displays the programmed daily start and stop times from Sunday thru Saturday and Holiday. If desired, the control center can be programmed to automatically start and stop the chiller on each as desired. This schedule will repeat on a 7 day calendar basis. If the **Daily Schedule** is not programmed, the default value is 00:00 AM start and stop times for all days of the week and the Holiday. (Note that the system will not automatically start and stop on a daily basis with these default values because 00:00 is an "Impossible" time for the Micro Board). (See Programming System Setpoints page 16.) Finally, one or more days in the week can be designated as a holiday (see

description under **HOLIDAY** setpoint) and the control center can be programmed (using **DAILY SCHEDULE** setpoint) to automatically start and stop the chiller on those days so designated. The operator can override the time clock at any time using the **COMPRESSOR START-RUN-STOP/RESET** switch.

Note that if only a **START** time is entered for a particular day, the compressor will not automatically stop until a scheduled **STOP** time is encountered on a subsequent day.

HOLIDAY - This key when pressed indicates which days in the upcoming week are holidays. On those designated days, the chiller will automatically Start and Stop via the holiday start and stop times programmed in the **DAILY SCHEDULE** setpoint. It will do this one time only and the following week will revert to the normal **DAILY SCHEDULE** for that day.

REMOTE RESET TEMP RANGE - This key when pressed displays the maximum permissible range of remote LCWT RESET (either 10° or 20°F). In remote key-switch mode this operator programmed value is added to the **CHILLED LIQUID TEMP** programmed value and the sum equals the temperature range in which the LCWT can be remotely reset. For example, if the **CHILLED LIQUID TEMP** (LCWT) setpoint is programmed with a value of 46°F and the **REMOTE RESET TEMP RANGE** is programmed to a value of 10°F, then the control center would accept any LCWT (1 to 11 second pulse width modulated) setpoint command (from a remote device) that falls between 46°F and 56°F (1 sec = 40°F, 11 sec = 46 + 10 = 56°F). If not programmed, the default value for this parameter is 20°F. Permissible values for the parameter are 10°F or 20°F. (See Programming the System Setpoints page 17.)

*Note: If an Energy Management System (EMS) is interfaced to the control center for the purpose of **REMOTE LCWT SETPOINT RESET**, then the operator programmed **REMOTE RESET TEMP RANGE** value determines the maximum value of temperature reset controlled by the EMS.

DATA LOGGER - Allows programming of/or display of, Auto-Print time interval and printer type message displayed is:

AUTO-PRINT INTERVAL = XX.X HRS; PRINTER = WTO

DISPLAYING SYSTEM SETPOINTS

The currently programmed **SETPOINT** values can be viewed at any time with keyswitch (see page 18) in **SERVICE**, **LOCAL** or **REMOTE** operating mode as follows:

- Press and release the appropriate **SETPOINT** key - the message will be displayed for 2 seconds.
- Press and hold the appropriate **SETPOINT** key - the message will be displayed as long as the key is pressed.

- Press and release the appropriate **SETPPOINT** key, then press and release the **DISPLAY HOLD** key. The message will be displayed until the **DISPLAY HOLD** key is again pressed and released or 10 minutes have elapsed; whichever comes first.

To Display **CHILLED LIQUID TEMP** Setpoint:

Use **CHILLED LIQUID TEMP** setpoint key as described above to produce the following message:

LEAVING SETPOINT = XX.X °F

*NOTE: The value displayed is the actual LCWT setpoint. For example, the value displayed in local or program keyswitch position is that which is operator programmed. The value displayed in the remote keyswitch position is that base setpoint with added temperature reset by an EMS, via remote LCWT setpoint (PWM signal) if a remote reset signal were received within 30 minutes.

To Display **% CURRENT LIMIT** Setpoint:

Use **% CURRENT LIMIT** setpoint key as described above to produce the following message:

CURRENT LIMIT = XXX % FLA

*NOTE: The value displayed is the actual % current limit setpoint. For example; the value displayed in local or program keyswitch position is that which is operator programmed. The value displayed in the remote keyswitch position is that which has been programmed by the EMS via the remote current limit setpoint (PWM signal) input (within 30 minutes).

To Display **PULL DOWN DEMAND** Setpoint:

Use **PULL DOWN DEMAND** setpoint key to produce the following message:

SETPPOINT = XX MIN @ XX % FLA XX MIN LEFT

To Display **CLOCK** Setpoint (Time of Day):

Use **CLOCK** setpoint key as described above to produce the following message:

TODAY IS DAY XX:XX AM/PM

To Display **DAILY SCHEDULE** Setpoints:

- Press and hold the **DAILY SCHEDULE** setpoint key.

The chiller start and stop times for each day of the week are sequentially displayed beginning with Sunday and ending with Holiday. The display will continuously scroll until the **DAILY SCHEDULE** key is released.

—or—

- Press and release the **DAILY SCHEDULE** Setpoint key. Then press and release the **DISPLAY HOLD** key. The chiller start and stop times for each day of the week are sequentially displayed beginning with Sunday and ending with holiday. The display will continuously scroll until the **DISPLAY HOLD** key is again pressed and released or 10 minutes have elapsed; whichever comes first.

The display message for **DAILY SCHEDULE** will scroll in the following sequence:

- SUN START = 08:30 AM STOP = 06:00 PM**
- MON START = 05:00 AM STOP = 07:00 PM**
- TUE START = 05:00 AM STOP = 07:00 PM**
- WED START = 05:00 AM STOP = 07:00 PM**
- THU START = 05:00 AM STOP = 07:00 PM**
- FRI START = 05:00 AM STOP = 07:00 PM**
- SAT START = 05:00 AM STOP = 01:00 PM**
- HOL START = 00:00 AM STOP = 00:00 PM**

To Display **HOLIDAY** Setpoints:

Use **HOLIDAY** setpoint key as described in the beginning of this section to produce the following message:

S _ M _ T _ W _ T _ F _ S _ Holiday noted by *

*NOTE: On the days that are designated by a *, the chiller will automatically start and stop per the **HOLIDAY** schedule established in **DAILY SCHEDULE** setpoints.

To Display **REMOTE RESET TEMP RANGE**:

Use **REMOTE RESET TEMP RANGE** setpoint key as described in the beginning of this section to produce the following message:

REMOTE RESET TEMP RANGE = 10°F

—or—

REMOTE RESET TEMP RANGE = 20°F

To Display **DATA LOGGER** Setpoints:

Use **DATA LOGGER** setpoint key to produce one of the following messages:

WWW PRINT INTERVAL = XX.X HRS; YY.Y HRS LEFT

The letters WWW represent the printer type. Actual message entries will be W-T (for Weigh-Tronix), OKI (for Okidata), T-I (for Texas Instruments), or EPS (for Epson). The default is W-T.

The characters XX.X represent the programmed

print time interval. This value can be .1 to 25.5.

The characters YY.Y represent the time remaining (to .1 hr. accuracy) until next auto-print occurs.

—or—

WWW PRINT INTERVAL = —NOT PROGRAMMED—

The letters WWW are explained above.

The —NOT PROGRAMMED— portion indicates no auto-print interval selected, though a printer may be selected, for manual print purposes.

PROGRAMMING MICRO-COMPUTER CONTROL CENTER

PROGRAMMING SYSTEM SETPOINTS

The system setpoints can be entered at any time . . . even when the system is running. Proceed as follows to enter system setpoints:

1. Turn **KEYSWITCH** to **PROGRAM**.
“Program” lamp will illuminate. (See Fig. 9).
2. **PROGRAM MODE SELECT SET POINT** message is displayed
3. Enter setpoints as detailed below. If you make a mistake when entering a value, press **CANCEL** then **ENTER** key and the display will revert to the default values and the cursor will return to the first changeable digit. You can then proceed to enter the correct values. If the entered value exceeds acceptable limits,
OUT OF RANGE - TRY AGAIN! Message will be displayed for 2 seconds and the “Program mode, select setpoint” message will reappear.
4. Return **KEYSWITCH** to **LOCAL**, **REMOTE** or **SERVICE** modes. “PROGRAM” L.E.D. lamp will extinguish.

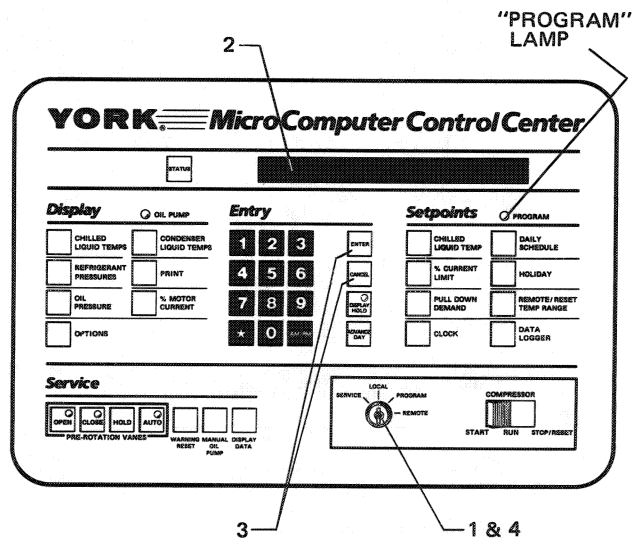


FIG. 9 - KEYPAD - PROGRAMMING SYSTEM SETPOINTS

To Enter **CHILLED LIQUID TEMP** Setpoint: (Refer to Fig. 10.)

1. Press and release **CHILLED LIQUID TEMP** setpoint key. The following program prompt message will be displayed:

LEAVING SETPOINT = XX.X °F (BASE)

(Base) refers to the base or lowest setpoint available to an Energy Management System (EMS). If an EMS is applied, this value must be entered into the EMS. Refer to previous explanation or **REMOTE/RESET TEMP RANGE**.

2. Use **ENTRY** keys to enter desired value.
3. Press and release **ENTER** key.

PROGRAM MODE, SELECT SETPOINT message is displayed.

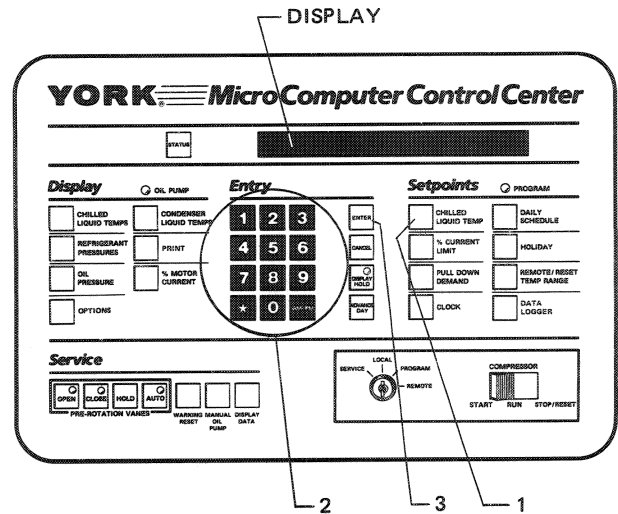


FIG. 10 – KEYPAD – PROGRAMMING “LEAVING CHILLED WATER TEMP.” SETPOINT

To Enter **% CURRENT LIMIT** Setpoint: (Refer to Fig. 11)

1. Press and release **% CURRENT LIMIT** setpoint key. The following program prompt message is displayed:

CURRENT LIMIT = XXX% FLA

2. Use **ENTRY** keys to enter desired value.
3. Press and Release **ENTER** key.

PROGRAM MODE, SELECT SETPOINT message is displayed.

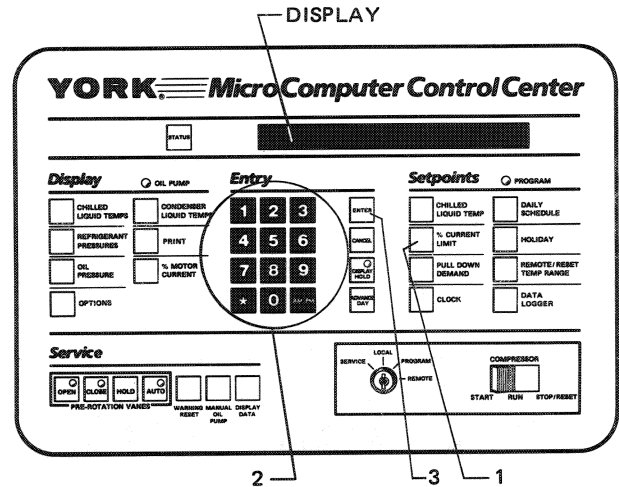


FIG. 11 – KEYPAD – PROGRAMMING “% CURRENT LIMIT” SETPOINT

To Enter **PULL DOWN DEMAND** Setpoint: (Refer to Fig. 12)

1. Press and release **PULL DOWN DEMAND** setpoint key. The following program prompt message is displayed:

SETPOINT = XXX MIN @ XXX % FLA, XX.MIN LEFT

2. Use **ENTRY** keys to enter desired values. See **PULLDOWN DEMAND** page 12. Note that ‘XX min left’ is not an operator entered value.
3. Press and release **ENTER** key.

PROGRAM MODE, SELECT SETPOINT message is displayed.

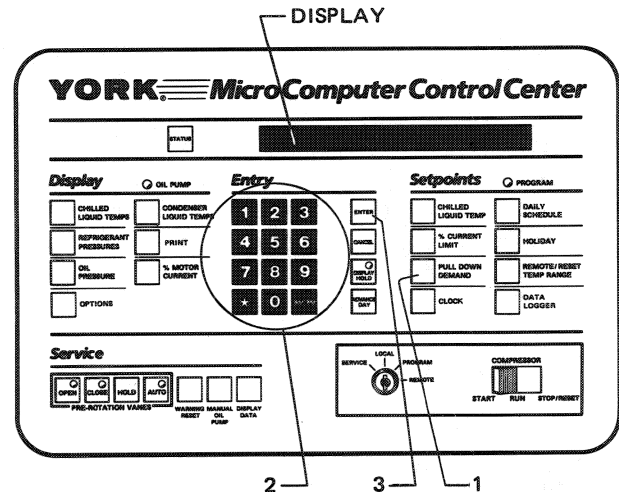


FIG. 12 – KEYPAD – PROGRAMMING “PULL DOWN DEMAND” SETPOINT

To Enter **CLOCK** Setpoint: (Refer to Fig. 13)

1. Press and release **CLOCK** setpoint key. The following program prompt message is displayed:

TODAY IS MON 10:30 PM

2. Press **ADVANCE DAY** key until the proper day of week appears on the display.
3. Use **ENTRY** keys to enter proper time of day.
4. Press **AM/PM** key to change the AM to PM or vice versa.
5. Press and release **ENTER** key.

PROGRAM MODE, SELECT SETPOINT message is displayed

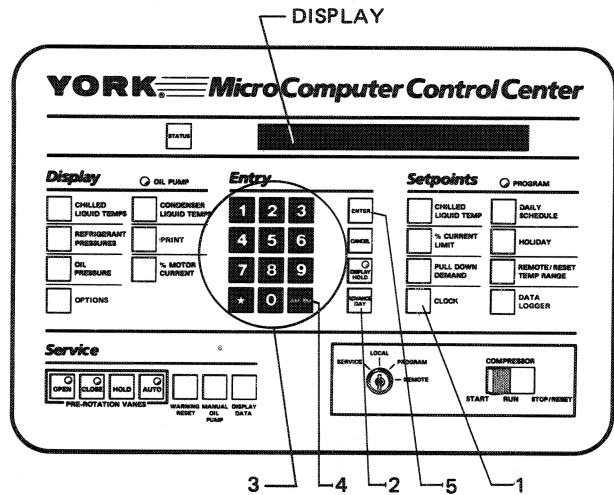


FIG. 13 – KEYPAD – PROGRAMMING “CLOCK” SETPOINT

The Enter **DAILY SCHEDULE** Setpoint (Refer to Fig. 14.)

1. Press and release **DAILY SCHEDULE** setpoint key. The following program prompt message is displayed:

DAY START XX:XX AM/PM STOP XX:XX AM/PM

2. Press **ADVANCE DAY** key until the day you wish to program appears on the display.
3. Use **ENTRY** keys to enter desired start time. If you wish to cancel the scheduled, start and stop times for a particular day, press **CANCEL** then **ENTER** key.
4. Press **AM/PM** key to change the AM to PM or vice versa. If the desired entry is already displayed, proceed to enter the stop time. The cursor will automatically move to the stop time.
5. Use **ENTRY** keys to enter desired stop time.
6. Press **AM/PM** key to change the AM to PM or vice versa.

7. Press and release **ENTER** key. PROGRAM MODE, SELECT SETPOINT message is displayed.

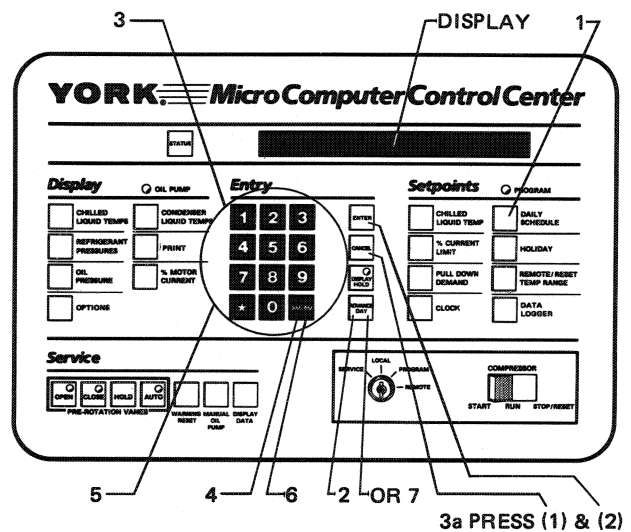


FIG. 14 – KEYPAD – PROGRAMMING “DAILY SCHEDULE” SETPOINT

—or—

Press **ADVANCE DAY** key. The display will advance to the next consecutive day and the previous day will be automatically entered.

To Enter **HOLIDAY** Setpoint: (Refer to Fig. 15.)

1. Press and release **HOLIDAY** setpoint key. The following program prompt message is displayed:
S _ M _ T _ W _ T _ F _ S _ HOLIDAY NOTED BY *
2. Press and release **ADVANCE DAY** key to move cursor to the day that you wish to designate as a holiday.
3. Press and release * entry key. A * will appear next to the selected day.
4. After you have placed a * next to each of the days that you wish to designate as a holiday, press **ENTER** key. **PROGRAM MODE, SELECT SETPOINT** message is displayed.

To cancel all of the designated holidays: Perform Step 1, press **CANCEL** key then press **ENTER** key. **PROGRAM MODE, SELECT SETPOINT** message is displayed.

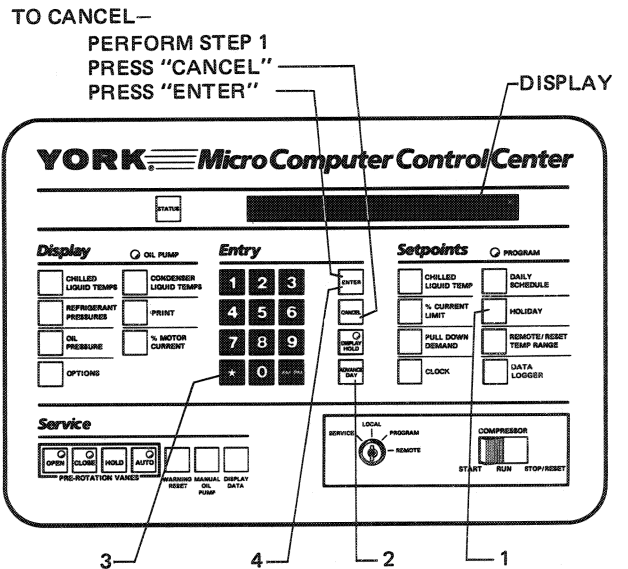


FIG. 15 – KEYPAD – PROGRAMMING “HOLIDAY” SETPOINT

To Enter **REMOTE/RESET TEMP RANGE** Setpoint: (Refer to Fig. 16)

1. Press and release **REMOTE/RESET TEMP RANGE** setpoint key. The following program prompt message is displayed:
REMOTE/RESET TEMP RANGE = XX °F
2. Use **ENTRY** keys to enter desired value (10 or 20).
3. Press and release **ENTER** key. **PROGRAM MODE, SELECT SETPOINT** message is displayed.

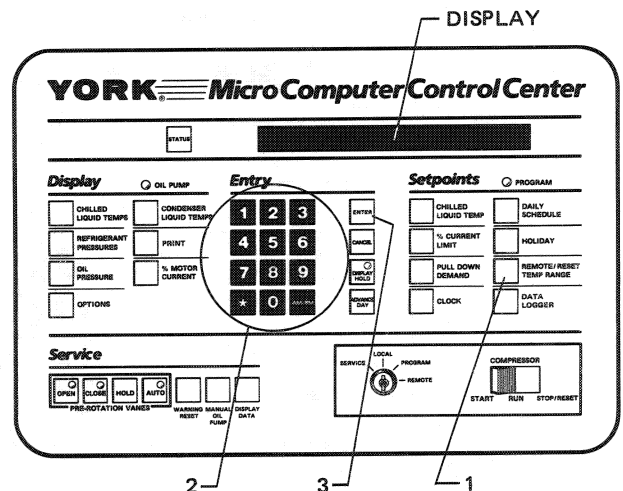


FIG. 16 – KEYPAD – PROGRAMMING “REMOTE RESET” TEMP RANGE

To Enter **DATA LOGGER** Setpoint: (Refer to 17).

1. Press and release **DATA LOGGER** setpoint key. The following program prompt message is displayed:

AUTO-PRINT INTERVAL = .0 HRS; PRINTER = WTO

2. Press the **DATA LOGGER** key repeatedly until the desired printer type is displayed. Selections are:
 WTO - Weigh-Tronix
 OK1 - Okidata
 TI2 - Texas Instruments
 EP3 - Epson
3. Use **ENTRY** keys to enter desired print time interval. The value 00.0 indicates auto-print not programmed.
4. Press and release **ENTER** key. "Program Mode, Select Setpoint" message is displayed.
5. Note: Whenever the data logger key is depressed in program mode, the enter key must be also pressed to prevent scrolling to the next printer selection.

Note: Whenever **DATA LOGGER** key is pressed, in program mode, the **ENTER** key must follow before exiting the **DATA LOGGER** session. This must be done, even if printer or setpoint changes are not required, to avoid automatic printer scrolling.

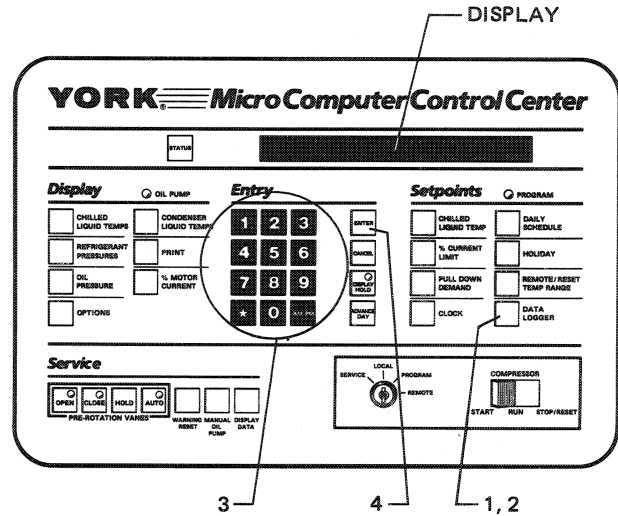


FIG. 17 - KEYPAD - PROGRAMMING "DATA LOGGER" SETPOINTS.

Refer to page 14 for programming sequence description.

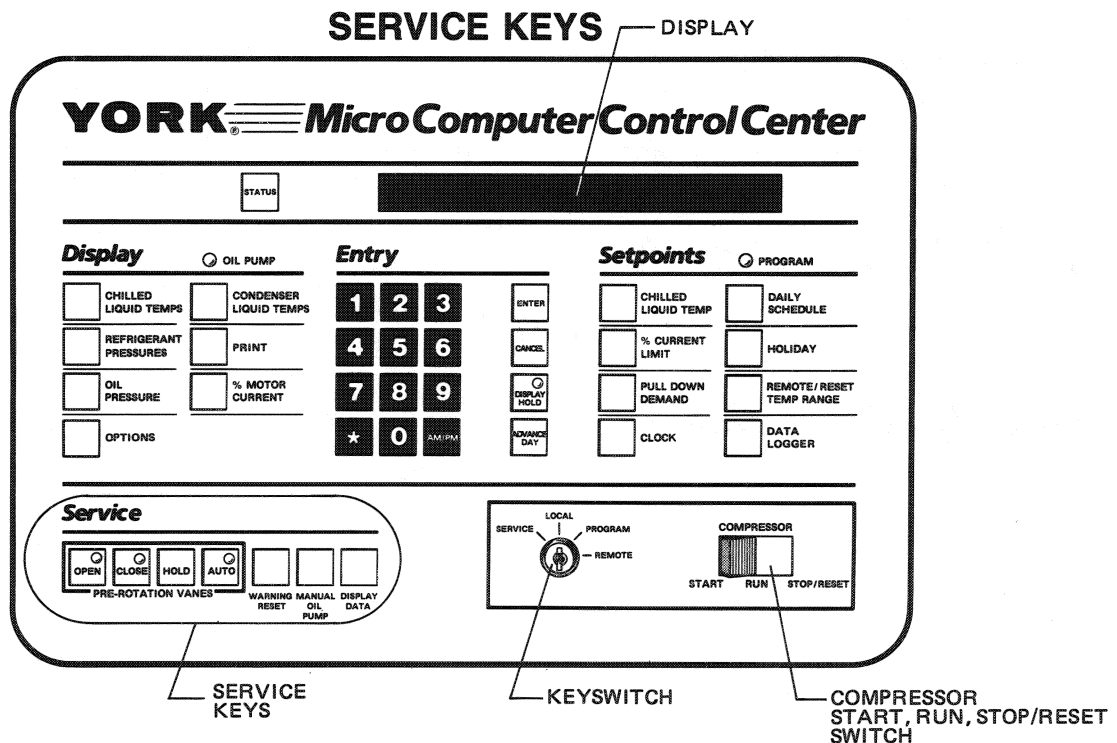


FIG. 18 - KEYPAD - SERVICE KEYS LOCATION

SERVICE KEYS (Refer to Fig. 18)

The **SERVICE** keys are provided for the Service Technician's use when performing routine maintenance or when troubleshooting the system or for the operator to check the operation of various components prior to starting the unit. All the **SERVICE** keys, except **DISPLAY DATA** and **MANUAL OIL PUMP**, are enabled to placing the **KEYSWITCH** in **SERVICE** mode. The **DISPLAY DATA** and **MANUAL OIL PUMP** key can be used in any operating mode (Service, Local, Remote).

PRE-ROTATION VANE KEYS

- **OPEN** – Press and release this key to drive the pre-rotation vanes open. The “OPEN” LED will illuminate. The vanes will continue to open until the **CLOSE**, **HOLD**, or **AUTO** (if temperature error requires it) keys are pressed and released. (This function enabled on non-Turbo-Modulator Applications only)
- **HOLD** – Press and release this key to hold the pre-rotation vanes in their present position. The vanes will remain stationary until the **OPEN**, **HOLD** or **AUTO** keys are pressed and released. (This function applies to non Turbo-Modulator Applications only)
- **AUTO** – Press and release this key to put the pre-rotation vanes under LCWT control. The actual opening and closing vanes will be indicated by the “OPEN” and “CLOSE” LED's on the **OPEN** & **CLOSE** keys if in service mode. Whenever the **KEYSWITCH** is turned to **LOCAL**, **PROGRAM** or **REMOTE** operating mode, the pre-rotation vane control circuitry is automatically placed in **AUTO** mode and the vanes operate to control the leaving chilled water temperature to the programmed setpoint.
- **WARNING RESET** – Press and release this key to reset the excess purge counting circuitry and the excess purge display message. Also, any “WARNING” or “STATUS” message can be reset with this key unless the condition still exists. To reset any cycling or safety shutdown message place the keyswitch in the service mode. When the shut down condition no longer exists, press the **COMPRESSOR** switch to **STOP-RESET** and then the **WARNING RESET** key.
- **MANUAL OIL PUMP** – This key is operational in any key switch position. Press and release this key to run the oil pump. Press and release the key again to stop the oil pump. A 10 minute maximum is imposed

on the running of the oil pump (ie, the oil pump will automatically shut off after 10 minutes). If a longer running time is desired, the key must be pressed again.

- **DISPLAY DATA** – This key is operational in any control center mode of operation (Service, Local or Remote). It is used to display certain system operating parameters that are relevant to troubleshooting the chiller system.

Press and hold the **DISPLAY DATA** key. The following messages will sequentially scroll on the display. Each message will be displayed for 2 seconds.

No. 1

SAT TEMPS EVAP = XX.X°F, COND = XX.X°F

No. 2

DISCHARGE TEMP = XXX.X°F, OIL TEMP = XXX.X°F

No. 3

PURGE PRESSURE = XX.X PSIA

To hold each of the above messages, press and release the **DISPLAY DATA** key, then press and release the **DISPLAY HOLD** key. Message No. 1 above will be displayed and updated every 2 seconds until the **DISPLAY DATA** key is again pressed and released. Message No. 2 is then displayed and updated every 2 seconds until the **DISPLAY DATA** key is again pressed and released. Message no. 3 is then displayed and updated every 2 seconds until either the **DISPLAY DATA** key is again pressed and released (whereupon message no. 1 is displayed) or the **DISPLAY HOLD** key is pressed and released (whereupon the **DISPLAY DATA** messages are removed from the display.)

KEYSWITCH

(See Fig. 18, page 18)

The 4-Position keyswitch selects the control center mode of operation. It utilizes the same key that is used to unlock the control center door. The modes of operation are as follows:

- **SERVICE** – enables all the **SERVICE** keys except **DISPLAY DATA** and **MANUAL OIL PUMP** which are enabled in all keyswitch modes. See explanation of **SERVICE** keys page 19.
- **LOCAL** – This is the normal operating mode. The compressor can be started and stopped from the con-

trol center. Also the **DISPLAY** and **SETPOINT** parameters can be displayed.

- **PROGRAM** - Allows the operator to program the **SETPOINTS** parameters.
- **REMOTE** - In this mode the control center will accept control signals from a remote device (ie, Energy Management System) or cycling inputs. The control signal inputs are:

1. Remote Start

2. Remote Stop
3. Remote LCWT Setpoint
4. Remote Current Limit Setpoint

*NOTE: The compressor can be stopped by the Compressor Switch regardless of the keyswitch position. The switch must be in RUN position to enable REMOTE operation. The operator cannot locally start the compressor using the START-RUN-STOP/RESET switch when in the REMOTE mode.

COMPRESSOR START RUN, STOP/RESET SWITCH

COMPRESSOR START, RUN, STOP/RESET SWITCH (See Fig. 18, page 18)

This rocker switch is used to locally operate the compressor. It is used to start, run and stop the compressor. Also, it resets the control center after a safety shutdown.

To **START*** Codepak compressor in local keyswitch position:

Move COMPRESSOR switch from STOP/RESET to START position. Switch will spring-return to RUN position.

To **STOP** compressor:

Move switch from RUN to STOP/RESET position.

To **RESET** control center:

Following a safety shutdown, the operator is required to reset the control center prior to restarting the system. Move switch from RUN to STOP/RESET position.

*NOTE: The operator cannot start the compressor (using this switch) when the keyswitch is in REMOTE mode.

DISPLAY MESSAGES

The following background messages will be automatically displayed unless the operator is requesting additional information via the keypad.

SYSTEM RUN - CURRENT LIMIT IN EFFECT

Displayed when the chiller is running and the motor current is equal-to or greater-than the operator programmed "XXX % FLA" current limit value. When the motor current reaches 100% of this value, the pre-rotation vanes are not permitted to open further. If the current continues to rise to 104% of this value, the vanes will be driven closed; not fully closed . . . only far enough to allow the current to decrease to a value less than 104% of the operator programmed "XXX % FLA current limit. For example:

With the operator programmed "% CURRENT LIMIT" set at 50% and the FLA of the chiller equal to 200A, the current limit circuit would perform as follows:

100% (50% X FLA) = Vanes Inhibited from opening further

104% (50% X FLA) = Vanes driven toward close position

Therefore:

100% (50% X 200) = 100A = Vanes stop opening

104% (50% X 200) = 104A = Vanes driven toward close position.

SYSTEM RUN-LOW PRESSURE LIMIT IN EFFECT

Displayed when the chiller is running and the evaporator pressure falls to 5.55 PSIA. Simultaneously, the pre-rotation vanes will be prevented from further opening. This action maintains chiller operation to prevent low evaporator

pressure shutdown at 5.42 PSIA. When the evaporator pressure rises to 5.65 PSIA, the vanes will be permitted to open.

SYSTEM RUN-HIGH PRESSURE LIMIT IN EFFECT

Displayed when the chiller is running and the condenser pressure rises to 28.8 PSIA. Simultaneously, the pre-rotation vanes will be inhibited from further opening. This action occurs to prevent system shutdown on high condenser pressure at 29.7 PSIA. When the condenser pressure falls to 28.6 PSIA, the vanes will be permitted to open.

SYSTEM RUN - PRESS STATUS

Displayed when the chiller is running. It instructs the operator to press the STATUS button, whereupon one of the following messages will be displayed:

- **WARNING: COND OR EVAP TRANSDUCER ERROR**

Indicates a probable condenser or evaporator transducer problem because the output is unreasonable. The microprocessor arrives at this conclusion by subtracting the evaporator transducer output from the condenser transducer output. The result must be zero or some positive number. If the result is a negative number, it concludes that there is a probable condenser or evaporator transducer problem. This function is inhibited for the first 10 minutes of chiller run time and checked every 10 minutes thereafter. Message is reset by pressing the **WARNING RESET** key in the **SERVICE** mode.

- **WARNING: PURGE FLOAT SWITCH ERROR**

Indicates the microprocessor is receiving conflicting digital signals from purge top float switch and purge bottom float switch (ie. liquid is simultaneously above TFS and below BFS. . . . An impossible condition). Message reset by pressing **WARNING RESET** key with keyswitch in the **SERVICE** mode.

- **WARNING: PURGE TRANSDUCER ERROR**

Indicates that purge pressure, as sensed by purge pressure transducer, is greater than 70 PSIA (for 255 sec.). Message is reset by pressing **WARNING RESET** key with keyswitch in the **SERVICE** mode.

- **WARNING: HIGH PURGE PRESSURE**

Indicates that purge pressure, as sensed by purge pressure transducer, is greater than 55 PSIA (for 255 sec.). Message is reset by pressing **WARNING RESET** key with keyswitch in the **SERVICE** mode.

- **WARNING: EXCESS PURGE - PRESS WARNING RESET**

Indicates that 6 or more exhaust cycles have occurred within 3 fill cycles **WARNING RESET** key must be pressed to clear display with keyswitch in the **SERVICE** mode. This function is inhibited for the first 30 minutes of chiller run-time.

***NOTE:** If the **STATUS** key is arbitrarily pressed, without the operator being prompted by the **PRESS STATUS** message, the following message shall be displayed.

NO MALFUNCTION DETECTED

SYSTEM RUN - LEAVING TEMP CONTROL

Displayed while the chiller is running. Indicates that the pre-rotation vanes are being controlled by the leaving chilled water temperature (LCWT). This is the normal mode of chiller operation. Thus if the LWT is above the setpoint but pulling down rapidly, the vanes will pulse closed as the LWT nears the setpoint.

SYSTEM READY TO START

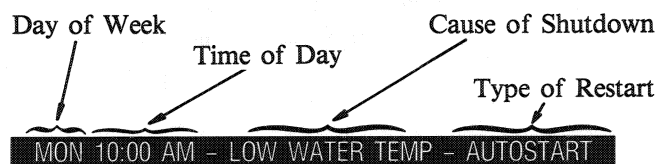
Indicates that the system is not running but will start upon application of a local or remote start signal in local or remote keyswitch position respectively.

SYSTEM SHUTDOWN-PRESS STATUS

Displayed when chiller is shutdown on a cycling (automatic restart if jumper is on microboard), safety control shutdown (operator must press the Stop/Reset "Compressor" switch to restart) or operator initiated shutdown (within 30 minutes of initial start-up). The status message consists of the day and time of shutdown, cause of shutdown, and type of restart required. Upon pressing STATUS key message will be displayed for 2 seconds and then return to

SYSTEM SHUTDOWN-PRESS STATUS
Display can be held indefinitely by depressing **DISPLAY HOLD** key.

SYSTEM SHUTDOWN MESSAGES ARE AS FOLLOWS:



Codepak was shutdown on Monday at 10:00 AM because the LCWT has decreased to a value that is 4°F below the operator programmed chilled liquid temp setpoint. However, if the setpoint is less than 40°F, the chiller will

always shutdown at 36 °F. Further, if the chiller is running and anytime the setpoint is changed, the LWT cutout will be 36 °F for 10 minutes in order to eliminate nuisance trips. Finally, for brine chilling applications the LWT cutout is always 4 °F below the setpoint. (The water jumper on the Micro Board must be removed for a brine unit)

MON XX:XX AM - LOW WATER TEMP - TM - AUTOSTART

Turbo-Modulator has shutdown the chiller because the LCWT has decreased to a value that is 4 °F below the operator programmed chilled liquid temp setpoint. If the chiller is running and the setpoint is increased greater than 4 °F, the Turbo-Modulator will initiate a shutdown. The shutdown is caused by LWT contact supplied from the T-M unit. To cause the Micro Board to monitor the T-M LWT input, the non-T-M jumper on the Micro Board must be removed.

MON XX:XX AM - FLOW SWITCH - AUTOSTART

Chiller is shutdown because a chilled liquid flow switch has opened. The flow switch must open for a minimum of 2 seconds in order to cause a shutdown.

MON XX:XX AM - SYSTEM CYCLING - AUTOSTART

A remote command (computer relay contact or manual switch) connected to the Remote/Local cycling input of the digital input board has shutdown the chiller.

MON XX:XX AM - MULTI UNIT CYCLING - AUTOSTART

Lead/Lag sequence control option accessory has shutdown the chiller.

MON XX:XX AM - POWER FAILURE AUTOSTART

The undervoltage relay has shutdown the chiller because the control center power (115 VAC) has decreased to 88-90 VAC. This message will only be displayed and the chiller will automatically restart only if the AUTO RESTART programmable jumper plug is installed on the Micro Board. The undervoltage relay will allow a system restart when the voltage rises to 101 (± 1) VAC. The Micro Board is factory programmed for manual power failure operation. To convert it to AUTO RESTART, remove one of the two pin programming jumpers from the spare parts cloth bag located inside of the control center and place it over the two terminals labeled AUTO RESTART on the Micro Board.

MON XX:XX AM - INTERNAL CLOCK - AUTOSTART

The operator programmed daily stop schedule has shutdown the chiller. The chiller will automatically restart when the operator programmed daily start schedule initiates a start. It can be overridden by pressing the COMPRESSOR switch to the START position.

***NOTE:** When operating the chiller under internal clock control it is recommended that the “auto-restart” jumper on the micro board be removed. Because, if a power failure should occur while the chiller is shutdown by the internal clock, the chiller will start.

MON XX:XX AM POWER FAILURE

Undervoltage relay has shutdown system because the control center power (115 VAC) has decreased to 88-90 VAC. The undervoltage relay will allow the chiller to restart when the voltage rises to 101 (± 1) VAC. To restart the chiller press **COMPRESSOR** switch to **STOP/RESET** position and then the **START** position. This message will only be displayed when Micro Board auto restart program jumper is removed.

REMOTE STOP

This message will be displayed when a remote device (typically an Energy Management System) has commanded the chiller to shutdown. The chiller will restart upon application of a separate start signal from the remote device.

ANTI-RECYLCE, XX MIN LEFT

The chiller may not restart more frequently than every 30 minutes. Displayed when chiller is shutdown and there is time remaining on the anti-recycle timer. In normal operation, chiller cannot be restarted until

TIME LEFT = 00 MIN. However, when servicing the chiller it may be desirable to inhibit this 30 minute timer. If so, simply install a jumper plug in the unmarked terminals of the Micro Board directly under Auto-Restart jack on the Micro Board.

WARNING: Remove this jumper after servicing. Failure to do this voids the Warranty.

MON XX:XX AM - LOW EVAP PRESSURE

The chiller is shutdown because the evaporator pressure has decreased to 5.42 PSIA. The chiller will be allowed to start when the pressure increased to 5.43 PSIA. To restart chiller press the COMPRESSOR switch to the **STOP/RESET** position and then the **START** position.

MON XX:XX AM - LOW EVAP PRESSURE - BRINE

The chiller is shutdown because the brine LEP (not included with standard control center) safety contacts have opened. The brine LEP safety is located external to the control center. Safety cut-out settings will vary with the brine application. To restart the chiller wait until the safety con-

tacts close, press the COMPRESSOR switch to the STOP/RESET position and then the START position.

MON XX:XX AM - LOW OIL PRESSURE

The chiller is shutdown because the oil pressure has decreased to 15 PSID while running; or never achieved 20 PSID prior to compressor start during the oil pump pre-lube run. The chiller will be allowed to restart when the pressure increases to 20 PSID. Differential pressure is sensed by two pressure transducers. To restart chiller, press "COMPRESSOR" switch to STOP/RESET position and then the START position.

MON XX:XX AM - HIGH PRESSURE

The chiller is shutdown because condenser pressure has increased to 15 PSIG (29.7 PSIA). System will be allowed to restart when pressure decreases to 9 PSIG (23.7 PSIA). Pressure is sensed by an HP safety control that is located on a mounting bracket above the oil pump starter located on the condenser near the purge unit. This message is prompted by the opening of the HP safety control contacts. To restart chiller, press COMPRESSOR switch to the STOP/RESET position and then the START position.

MON XX:XX AM - EVAP TRANS OR PROBE ERROR

The chiller is shutdown because LCWT minus evaporator saturation temp $< -2.5^{\circ}\text{F}$ or $> 25^{\circ}\text{F}$. Results outside of the range are indicative of a defective evaporator transducer or leaving chilled water temperature thermistor. It is checked 10 minutes after compressor start and every 10 minutes thereafter. The chiller will operate only when the value is within the specific range. To restart the chiller, press COMPRESSOR switch to STOP/RESET position and then to the START position.

MON XX:XX AM - MOTOR CONTROLLER - EXT. RESET

The chiller is shutdown because of a current module (CM-1A Electro-Mechanical starter application) or the York Solid State Starter or Turbo-Modulator initiated shutdown. To restart system, reset the external device that caused the shutdown. The chiller will automatically restart.

*NOTE: The following motor controller shutdowns do not require an external reset:

1. Turbo-Modulator - PF, HA, FLTH
2. Solid State Starter - single phase or phase rotation.

MON XX:XX AM - POWER FAULT - AUTOSTART

The chiller is shutdown because of a Solid State Starter or current module (CM-1A Electro-Mechanical starter applica-

tion) "Power Fault" initiated shutdown. The chiller will automatically restart. This function is sensed by the motor controller input to the digital input board. A power fault shutdown is initiated by the motor controller contacts (CM-6) opening and reclosing in less than 3 seconds.

MON XX:XX AM HIGH DISCHARGE TEMP

The chiller is shutdown because the discharge temperature has increased to 220°F. The system will be allowed to restart when the temperature has decreased to 219°F. Temperature is sensed by a thermistor RS2 (See Fig. 2). To restart the chiller press COMPRESSOR switch to STOP/RESET position and then to the START position.

MON XX:XX AM HIGH OIL TEMP

The chiller is shutdown because the oil temperature has increased to 180°F. The system will be allowed to restart when the temperature decreases to 179°F. The temperature is sensed by a thermistor RS3 (see Fig. 2). To restart the chiller, depress STOP/RESET switch and then the START switch.

MON XX:XX AM - OIL PRESSURE TRANSDUCER

Chiller is shutdown because the oil pressure has increased to 60 PSID. The chiller will be allowed to restart when the oil pressure decreases to 59 PSID. Pressure is sensed by two oil pressure transducers that are sensing low and high sump pressure. This safety shutdown is provided primarily as a check on the oil pressure transducers since they may fail in a "High" state. Therefore, display of this message is generally indicative of a defective transducer or interface. To restart chiller press COMPRESSOR switch to STOP/RESET position and then to the START position.

VANE MOTOR SWITCH OPEN

Chiller is shutdown because a system start sequence has been initiated but the pre-rotation vanes are not fully closed.

MON XX:XX AM - STARTER MALFUNCTION DETECTED

The chiller is shutdown because the control center has detected a motor current value greater than 15% FLA for 10 seconds minimum anytime when the compressor start signal is not energized. To restart the chiller, press COMPRESSOR switch to STOP/RESET position and then to the START position.

MON XX:XX AM - PROGRAM INITIATED RESET

The chiller is shutdown because Micro Board did not receive a hardware generated interrupt on schedule. Typical is an Analog/Digital Converter interrupt. This message is indicative of a Micro Board hardware failure or electrical noise on Micro Board. The chiller will automatically restart. This message indicates that the watchdog timer circuit has reset the microprocessor. This occurs when the time to step

through program is longer than it should be thus the software program is initialized at its beginning.

SYSTEM READY TO START - PRESS STATUS

The chiller was shutdown on a safety shutdown and will start upon application of a local or remote start signal. Since the message states that the chiller is "Ready to Start", it means that the condition that caused the shutdown no longer exists and the control center has been manually reset. When the **STATUS** key is pressed a message is displayed that describes the reason for shutdown. The message will be displayed for 2 seconds and then return to

SYSTEM READY TO START - PRESS STATUS

Those messages that could be displayed are any of the previously described safety shutdown messages or warning messages. They can be cleared from the display by turning the keyswitch to **SERVICE** mode and pressing **WARNING RESET** key. Or, the message will be cleared by initiating a compressor start.

SYSTEM COASTDOWN

Displayed while motor is decelerating after a chiller shutdown. Displayed for a period of 150 seconds. The oil pump motor is running during this compressor coastdown period.

START SEQUENCE INITIATED

Indicates that the Micro Board has received a local or remote start signal and has initiated the chiller start-up routine. This is a 30 second pre-lube period prior to compressor start. Refer to start-up sequence description in Form 160.45-O1.1

REPLACE BATTERY - REPROGRAM SETPOINTS

Displayed anytime the battery voltage is less than 3.6 VDC and the **STATUS** key is pressed. If the status message is prompted by the background message

SYSTEM RUN - PRESS STATUS

it means that the battery voltage is less than 3.6 VDC. The 3-AA alkaline batteries should be replaced. However, the chiller will be controlled by the operator programmed setpoints.

If this status message is prompted by the background message **SYSTEM RUN - SETPOINT OVERRIDE** it signifies that the operator entered setpoints have been lost due to a power failure while the battery voltage is less than 3.6 VDC. The chiller will be controlled by the setpoint default values. The default values are as follows:

- Chilled Liquid Temp (LCWT) = 45°F
- Remote Chilled Liquid Temp (LCWT) = 45°F
- Remote/Reset Temp Range = 20°F
- % Current Limit = 100%
- Remote % Current Limit = 100%
- Pulldown Demand Limit = 100% for 00 min.
- Clock = Time of Day = Sun 12:00 AM
= Time of Day of Shutdown = Sun 12:00 AM
- Daily Schedule = 00:00 start and stop for all days (note that the system will not automatically start and stop on a daily basis because 00:00 is an "Impossible" time for the Micro Board)
- Holiday = 00:00 start and stop for all days.

To reset this message, the operator must replace the batteries. (Caution: Use only AA Alkaline Batteries). The battery life is approximately 30 days under the condition of total control-power interruption.

SYSTEM RUN - SETPOINT OVERRIDE

Displayed while chiller is running. This message indicates that there was a loss of 115 VAC control power while the battery voltage is less than 3.6 VDC. Therefore, the chiller is being controlled by the setpoint default values. If the **STATUS** key is pressed the following message is displayed:

REPLACE BATTERY - REPROGRAM SETPOINTS

MON 09:30 AM LOW OIL TEMPERATURE AUTOSTART

Whenever the oil temperature display readout falls below 78.9°F (53-56°F actual sensor temperature) or the oil temperature sensor is disconnected from the analog input board, the preceding message will appear. The system will automatically restart when the display readout indicates 83.8°F (71°F actual sensor temperature).

MON XX:XX AM FAULTY TEMP SENSOR

Whenever the discharge temperature sensor display readout falls below 71.5°F (3-26°F actual sensor temperature) or the discharge temperature sensor is disconnected from the analog input board, the preceding message will appear. To restart the system when the discharge temperature rises or the sensor has been connected, press the **COMPRESSOR STOP/RESET** position and then the **START** position.

*NOTE: The discharge and oil temperature sensors have been selected to provide accurate display readouts from 100 to 225°F. Below temperatures of 100°F, the accuracy of the readout diminishes.



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