

Refer to the User's Manual for complete instructions. The following describes various features of the terminal and screens as configured by the York factory.

**ACCESS CODE**

Screen #4-MAN/AUTO Control, Screen #12 PID Tune, and Screen #13-Condenser Controls are programmed for limited access to prevent unauthorized manual operation and changes to PID tuning parameters.

The access codes must be entered and the security enabled by the user while the terminal is in the configuration mode.

To add or delete operators having access to these screens, the program must be revised and downloaded to the terminal.

**SCREEN #1 : MISC. OPERATING STATUS**

This screen provides the capacity control signals, chiller load, motor current, and running time meter with total running time, running time since last start, and time to next start (time remaining on anti-recycle timer).

The total running time can be reset by temporarily setting B3/20 in the PLC bit file using a programming terminal. The running time since last start time is automatically reset whenever the chiller starts.

**CAUTION:** Whenever a new program is downloaded into the PLC, the total running time will be replaced by whatever values reside in the PLC counters accumulated value words.

Prior to downloading, the accumulated values of the following counters must be changed to the present values appearing on the screen.

C5:0.ACC = Minutes  
C5:1.ACC = Hours  
C5:2.ACC = Days

**SCREEN #2 : LUBE SYSTEM**

This screen will appear on initial power-up and on re-start after a power failure.

This screen would normally be used when enabling the chiller for manual start-up to view the condition of the lube oil system. The double yellow lines represent main lube oil piping. The objects on the screen change states as follows (next page).

Panelview Operator Terminal Description -  
E.I. Dupont Experimental Station - Wilmington, DE

SCREEN #2 : LUBE SYSTEM (Continued)

<u>OBJECT</u>	<u>STATE 0</u>	<u>STATE 1</u>
Motors/Gear/ Compr/Pumps	<b>Green</b> (not rotating)	<b>Red</b> (rotating)
Evap, Cond,	<b>White</b> (no water flow)	<b>Blue</b> (water flowing)
Oil Coolers	<b>Yellow</b> (no water flow)	<b>Blue</b> (water flowing)
Pre-alarm Indicator (Tag # Pre-fix PI-/PDI-/TI-)	<b>Cyan</b> (normal)	<b>*Yellow Blinking</b> (abnormal)
Shutdown Indicator (Tag #401, 501 etc.)	<b>Cyan</b> (normal)	<b>*Red Blinking</b> (shutdown)
Enable Start Pushbutton	<b>White</b> (Enable start)	<b>Yellow</b> (Start enabled)
Stop Pushbutton	<b>White</b>	<b>Red</b>
Start/Stop GAOP	<b>Green</b> (start GAOP)	<b>Red</b> (stop GAOP)
Start/Stop CAOP	<b>Green</b> (start CAOP)	<b>Red</b> (stop CAOP)
Pre-Lube Timer Indicator Text	<b>White</b> (not timing)	<b>Yellow</b> (timing - start initiated)
Post-Lube Timer Indicator Text	<b>White</b> (not timing)	<b>Yellow</b> (timing)
Anti-Recycle Timer Indicator Text	<b>White</b> (not timing, restart allowed)	<b>Yellow</b> (timing, restart inhibited)
Heaters	<b>Green</b> (off)	<b>Red</b> (on)

\* Pre-alarm and shutdown indicators will remain in alarm state until reset pushbutton (F20) is pressed after the conditions have returned to normal.

SCREEN #2 : LUBE SYSTEM (Continued)

The text to the left of the compressor will read "Compr. Stopped" (green) when the run interlock is open (relay R9 is de-energized), "Compr. Ready" (yellow) when the compressor motor starter interposing relays R4 and R5 are energized, and "Compr. Running" (red) when the starter auxiliary contact closes energizing relay R9.

SCREEN #3 : MAIN

This screen would normally be used during start-up to manually open the chilled water valve (PCV-706) and during normal and free cooling operation.

The lines are color coded to represent the following:

- Single Cyan** - Oil and refrigerant from bottom of evaporator to jet pump oil eductor.
- Double Cyan** - Main low pressure refrigerant gas.
- Single Red** - High pressure refrigerant liquid for interstage liquid injection.
- Double Red** - Main high pressure refrigerant gas, liquid, and hot gas bypass.
- Single Magenta** - Oil, refrigerant liquid and gas from jet pump oil eductor to oil separator.
- Double Magenta** - Main interstage refrigerant gas.
- Double Blue** - Main chilled and cooling water piping.

The object states are the same as the lube system with the following additions:

<u>OBJECT</u>	<u>STATE 0</u>	<u>STATE 1</u>
Oil Sep (Text)	White (not operating)	White/Red Background (operating)
Condenser Text Evaporator Text	White (no water flowing)	White/Blue Background (water flowing)
Solenoid Valve	Green (de-energized)	Red (energized)

SCREEN #3 : MAIN (Continued)

Major capacity control output signals to the compressor PRV (TCV-601A), interstage valve (TCV-601B) and hot gas valve (TCV-601C) are displayed in bar graph form with ranges of 0 to 100 percent (0=closed, 100=open).

Free Cooling

Free cooling operation is selected using the F7 CRT keypad button which is configured as a momentary pushbutton. When pressed and released, the Green "START FREE CLG" changes to Red "STOP FREE CLG" and the PRV and valves are opened. When pressed again and released, the indicator changes back to Green "START FREE CLG" and the PRV and valves return to their normal shutdown positions.

Chilled Water Flow Control

The chilled water outlet valve (PCV-706) and water flow (FI-601) may be manually controlled from this screen using function buttons F5 and F6 while observing the % displayed beneath the valve symbol and the GPM displayed to the right of the valve.

SCREEN #4 : MAN/AUTO

This screen would normally only be used on initial start-up of chiller to test valve operation and to determine min. and max. vane positions at low and high head conditions as described under Screen #12.

The INCR & DECR pushbuttons are activated by pressing the MAN pushbutton. Pressing the INCR/DECR button and releasing within 1 second will cause a 1% man output change. Pressing the INCR/DECR button and holding for more than 1 second will cause a 5% per second manual output change. To insure bumpless transfer from manual to automatic, the manual signal must be equal to the automatic signal (CV). Transfer is inhibited if signals are not equal ( $\pm 5\%$ ).

The MAN and AUTO pushbuttons indicate the mode selected as follows:

	<u>COLOR IN</u> <u>AUTO MODE</u>	<u>COLOR IN</u> <u>MAN. MODE</u>
MAN Pushbutton	White	Yellow
AUTO Pushbutton	Cyan	White

SCREEN #4 : MAN/AUTO (Continued)

The red warning "MAN/AUTO TRANSFER INHIBITED" appears if a transfer is attempted with CV & Man. Output not equal. The red warning "HI MTR AMPS DECR PRV MAN OUTPUT" appears if the operator opens vanes too far causing excessive load on the motor. Operator should immediately decrease PRV signal until this message disappears.

If during manual operation, the unit is started or stopped the controls are returned to automatic so that the PRV and valves return to their safe positions.

SCREEN #5 : CAPACITY CONTROLS

The Capacity Control screen #5 is an abbreviated representation of the capacity control diagram (See Capacity Controls Operation - Figure 1). This screen shows how the outputs of the various controller blocks react to their respective input signals. It also shows how the various controller outputs are selected via low selector or high selector relays at intermediate stages, and shows which signals become the dominant control signal to the controlled analog output devices (compressor Pre-rotation vanes; hot gas bypass valve and interstage valve).

This screen would also be used along with screen #12 (PID TUNE), on initial start-up of the chiller to establish optimum tuning parameters for the controllers, to provide the most efficient chiller operation.

The temp controller (TC-601) block has a "manual" indicator which blinks yellow whenever this control is in the manual mode.

This occurs when the unit is shutdown, during ramp-up and whenever the PRV Man/Auto station is in manual.

With unit stopped, TC-601 is in manual, its set point is equal to the chilled water out temperature and its output is equal to the PRV signal before CR-2. (When in manual TC-601 drives its output to same as tieback input).

PDC-102A output is at 24% (with initial tuning values) since there is no differential pressure.

When start is initiated, the PRV signal goes to 30% and TC-601 output is driven to 30%.

SCREEN #5 : CAPACITY CONTROLS (Continued)

When the starter interlock closes, the PRV signal slowly increases (LSR-2 selects the lower ramp signal), and the hot gas valve signal slowly decreases.

During the ramp-up, TC-601 set point will track the chilled water temperature and its output will be driven to equal the PRV output signal before CR-2.

If the ramp signal (SS-3 output) rises above the minimum vane signal (HSR output) the PRV will open only at the rate the head increases to cause PDC-102A output to increase, and will only open as far as this signal allows since LSR-2 will select the lower signal.

If during ramp-up the capacity increases sufficiently to lower the chilled water outlet temperature to less than 0.5°F above the desired setpoint, TC-601 is changed to the automatic mode and its output now changes in response to load changes.

If the chilled water temperature continues to fall, TC-601 output will decrease causing the hot gas valve and PRV to move to whatever positions are required to maintain the chilled water at set point.

If the unit is started with a high load, the chilled water temperature will not be reduced substantially during ramp-up because the vanes will only open to the minimum vane position as described above.

When the ramp-up is completed and TC-601 is changed to automatic, its setpoint will return to whatever the setpoint is stored in panelview memory at that time.

TC-601 output will then increase to open the vanes and bring the water temperature to set point.

If the PRV is put in manual mode at any time, TC-601 is put in manual mode and the tieback input is used to drive the TC-601 output to the same value as the manual control output.

The above tracking and tieback controls provide a bumpless transfer from manual to automatic control after the ramp-up period and also after manually controlling the PRV.

SCREEN #6 : LUBE OIL STATUS

This screen provides a list of all measured lube oil pressures and temperatures, compressor sump and balance piston pressures, present status, and the safety alarm and shutdown setting (if applicable) for each.

If the present status value exceeds the safety setpoints, the alarm value changes to yellow (blinking) and the shutdown value changes to red (blinking) and remains in this state until the reset button (F20) is pressed after the condition returns to normal.

SCREEN #7 : REFRIG AND WATER STATUS

This screen provides a list of all measured refrigerant-134a and water pressures and temperatures, present status, and the safety alarm and shutdown settings (if applicable) for each.

It functions the same as Screen #6.

SCREEN #8: BEARING & CASING STATUS

This screen provides a list of all measured bearing temperatures, and casing vibration, present status, and the safety alarm and shutdown setting for each.

It functions the same as Screen #6.

SCREEN #9 : SCREEN LIST

This screen allows the user to select any other operating screen and also the alarm history screen which shows the last 21 alarms that occurred, the date and time of occurrence, and the date and time the alarm was acknowledged.

SCREEN #11: BEARING/CASING VIBRATION

This screen provides a graphical representation of the motor, gear and compressor. It shows all the measured bearing temperatures and casing vibration. The tag numbers provide pre-alarm and shutdown indication, which operate the same as those on screen# 2.

SCREEN #12: PID TUNE

This screen would normally only be used on initial start-up, or whenever it becomes necessary to fine tune the capacity controls due to changing operating conditions. The effects of changes to the PID tuning changes are observed by changing back to the Capacity Controls screen #5 (A programmed button is provided to allow for direct changing between these two screens).

The adjustable tuning parameters are shown with a white and a cyan number, separated with a "/". The white numbers are the values stored in Panelview memory, and the cyan numbers are the value currently used by the PID controller. The controllers are configured using ISA equations, with the following values:

SP = Set point  
P = Controller Gain x 0.01  
I = Reset Time x 0.01 Minutes/Repeat  
BIAS = Feed-forward or Constant Bias

Refer to the Allen-Bradley processor manual (chapter 15) for additional information on the PID instruction.

Changing Tuning Parameters

To change tuning parameters, press "Select" on the keypad to activate the numeric input cursor point, then use the arrow keys to move the Red cursor to the desired position.

**NOTE:** When changing the set point of TC-601, three digits must be entered, i.e. a new set point of 45.5 would be entered 455.

The setpoints for IC-551 and TC-601 must be within the following ranges:

IC-551 set point = 157 min. to 298 max.  
TC-601 set point = 40.0 (400) min to 80.0 (800) max.

After entering the new value in the scratchpad area at the top of the screen, press "Enter" to replace the existing value at the cursor. Change as many values as required and then press "Cancel" to remove the scratchpad. To enter the new values into the PID instructions in the processor, press the "Load" pushbutton.

SCREEN #12: PID TUNE (Continued)

**CAUTION:** Before pressing "LOAD" button, be sure all tuning parameters are at the proper values. To insure that the new values are retained after a power failure, set the power-up values to "LAST STATES." To do this, place the Panelview in the configuration mode and select "PRESET OPERATIONS" from the menu.

This button should blink red one time indicating that the new values have been entered, and the cyan numbers should change to the new values.

The tuning values shown are estimated only and may require adjustment depending on actual chiller operating conditions.

Anti-Surge Controller (PDC-102A) Tuning

The Anti-surge controller (PDC-102A) tuning values are based on estimated conditions as follows:

	<u>Compressor</u> <u>Diff. Press.</u>	<u>Min.Vane</u> <u>Signal (before</u> <u>CR-2) @ Surge</u>
High Head	70 PSID	37%
Low Head	18 PSID	27%

It is very important that this control be adjusted to suit actual chiller operating conditions to achieve maximum efficiency of operation.

You must first establish the actual high and low head minimum vane signals as accurately as possible by manually holding the hot gas valve closed and closing the vanes (to maintain leaving chilled water temperature) until the compressor begins to surge. Note and record the "MAN PRV signal" at high and low head surge.

If actual operating conditions are different: e.g. 40% high head and 30% low head min. vane signals, you must determine the required tuning values for PDC-102A to produce a 40 to 30% signal as follows:

High Head Signal = 40 %  
Low Head Signal = 30 %

Assuming the high and low head differential pressures are 70 and 18 PSID, the setpoint (SP) must be at mid point or 44 PSID, with an output of 35% (i.e.  $[40\%+30\%]\div 2$ ). The Bias (BI) must be set to equal the output at set point:

SCREEN #12: PID TUNE (Continued)

$$\text{Bias} = .35 \times 4095 = 1433$$

To determine the Proportional Gain (P) setting:

$$\begin{aligned} P &= \frac{\text{Output Chg \%}}{\text{Input Chg \%}} = \frac{(\text{Hi head output\%}) - (\text{Low head output\%})}{[(\text{Hi Head } \Delta P) - (\text{Low Head } \Delta P)] \div \text{Span} \times 100} \\ &= \frac{(40\% - 30\%)}{[(70 - 18) \div 200] \times 100} = \frac{10}{26} = 0.38 \end{aligned}$$

Since the value entered is actually a multiple of .01, the actual P value entered must be 38 (38 ÷ .01).

Hot Gas Control (TC-601C) Tuning

To determine the new P (Gain) setting for TC-601C to achieve full hot gas (100% output) as a decreasing load causes TC-601 output to drop below the minimum vane set point (30%) to 0%:

$$P = \frac{\text{Output Chg \%}}{\text{Input Chg \%}} = \frac{100}{30} = 3.33 \div .01 = 333$$

The Bias setting on the hot gas control (TC-601C) is used to provide a safety zone between actual surge and the minimum vane position (SP). Since this value is added to the result of the PID calculation [P (SP-PV)] to produce the actual signal, a value greater than 0 will cause the hot gas valve to open sooner. For example, if SP = PV, CV = P (SP-PV) + BIAS = 3.33(0) + 5% = 5%. This will allow the hot gas valve to begin opening before the vanes reach their minimum position, providing a smooth transition from PRV to hot gas control of the chiller capacity.

Ramp Tuning

The ramp rate determines how fast the vanes are allowed to open and the hot gas valve is allowed to close on start-up after the motor starter run interlock closes. Increasing the rate will decrease the total ramp-up time displayed in seconds beneath the rate.

SCREEN #12: PID TUNE (Continued)

The total ramp-up time displayed will not change until the new rate has been loaded. For example, if the current rate setting of 16 were increased to 20, the ramp-up time would decrease from 128 seconds to 102 seconds after the "load" pushbutton is pressed. If the rate setting were decreased to 12, the ramp-up time would increase to 171 seconds.

SCREEN #13: CONDENSER CONTROLS

This screen would normally be used only when it is necessary to manually control the condenser water flow or change the minimum condensing pressure control (PC-102) or condenser water flow control (FC-604) tuning values.

The manual/auto control and tuning operations are the same as described for screen #4 Man/Auto and screen #12 PID Tune.

**Note:** When entering the setpoint for FC-604, a 3 digit number must be entered since the controller is scaled 0-140 (actual setpoint in GPM = Entered value x 100).

The controller is scaled 0-140 so that its output does not change with flow transmitter signal fluctuations of  $\pm 49$  GPM or less, thus providing more stable operation of the condenser water regulating valve PCV-102.

The flow controller (FC-604) block has a "manual" indicator which blinks yellow whenever this control is in the manual mode.

This occurs when the unit is shutdown, during start-up, whenever PC-102 is controlling the valve due to low condenser pressure, and whenever the valve Man/Auto station is in manual.

With unit stopped, FC-604 is in manual, its set point is equal to the condenser water flow and its output is equal to the signal after the free cooling selector. (When in manual FC-604 drives its output to equal the tieback input).

The free cooling selector output is 0 when not in free cooling and 100% when in free cooling mode.

When start is initiated, the CR-7 output signal slowly increases, and the water valve slowly opens.

**SCREEN #13: CONDENSER CONTROLS** (Continued)

During the start-up, FC-604 set point will track the condenser water flow and its output will be driven to equal the CR-7 output signal.

If the PC-102 output falls below the CR-7 output signal due to cold condenser water, the water valve will only open as far as the PC-102 output signal allows since LSR-4 will select the lower signal.

When the water flow increases to 6000 GPM, FC-604 is switched to the automatic mode (unless the PC-102 output signal is lower than the CR-7 output), the setpoint is returned to whatever is stored in the Panelview memory at that time, and its output now changes to maintain the desired flow rate.

**SCREEN #14: CHILLER STATUS (PG.1)**

This screen provides a list of all the measured pressures, temperatures and flows and shows the present status of each.

The pushbutton indicator for function button F8 shows if automatic printing of the screen (as well as Screen #15 and #16) has been selected.

The time interval between prints is changed using the same procedure as described for changing tuning parameters on Screen #12: PID Tune.

The function button F5 is used to print only this screen and may be used to test the printer.

**Note:** The Panelview terminal will support any serial IBM (or compatible) text printer. Before printing, ensure that the printer and the terminal have the same serial parameters including baud rate, parity, data bits and stop bits.

This must be done with the terminal in the configuration mode. See the Panelview User's Manual for more information.

With the printer connected and working properly, and "auto Print" enabled, the PLC will automatically change the terminal screen first to #14, then to #15 and #16, and print them every time the time interval between prints has elapsed.

SCREEN #14: CHILLER STATUS (PG.1) (Continued)

These screens are also printed any time there is an abnormal operating condition. The prints would be run during a pre-shutdown condition and also 2 seconds prior to shutdown if the condition degrades to that point, thus providing a record of all system parameters for use in diagnosing the cause of the malfunction.

The PLC then changes the screen to #3: Main and the operator may then change to other screens if desired.

SCREEN #15: CHILLER STATUS (PG.2)

This screen provides a list of other measured parameters (not shown on Screen #14) and control output signals, and shows the present status of each.

It functions the same as Screen #14.

SCREEN #16: ALARM STATUS

This screen displays active and inactive alarms, the number of times a point has gone into alarm (the alarm count) and the total amount of time a point has been in alarm.

Refer to Panelview User's Manual for more information on this screens features.

When the automatic print mode is selected on Screen #14, the "Active Alarms Mode" screen will be printed.