

System 016 - Site 501529, Pasco, WA

Site 501529 is a grocery store located in Pasco WA. There are four refrigeration circuits—a low temperature Circuits 16 and 17 and medium temperature Circuit 14 and 15 – installed in approximately 2000. Both racks share a single Emerson E2 refrigeration system controller.

Circuit 16 and 17, Low Temperature

Circuits 16 and 17 is a low temperature multiplex system with four semi-hermetic screw compressors and R22 refrigerant. Compressor 1 on Circuit 16 is controlled by a suction pressure setpoint with a sensor located on one end of the suction manifold. Compressors 2 to 4 on Circuit 17 are controlled by a suction pressure setpoint measured at the opposite end of the suction manifold. All four compressors discharge into a common discharge manifold. The circuits share a heat recovery desuperheater, condenser and common liquid manifold. The desuperheater recovers heat from the hot discharge gas to heat hot water, which also decreases the gas temperature before entering the condenser, increasing refrigeration efficiency. The low temperature rack serves 13 evaporator circuits.

Table 1. Measured data on Circuit 16

Measured Data	Variable Name(s)	Point Number
Outdoor Temperature	TT_OUTDOOR	--
Discharge Temperatures after each Compressor	MISC1	2
Common Discharge Temperature	TT_RCOMP_OUT	2
Suction Temperatures before each Compressor	MISC7	1
Compressor Power	EP_COMP	--
Low Pressure, Suction Manifold	PT_RLP	1
High Pressure, Discharge Manifold	PT_RHP	2
Condenser Entering Temperature	TT_RCOND_IN	3
Condenser Fan Power	EP_AUX_SECW	--
Condenser Leaving Temperature	TT_RCOND_OUT	6
Temperature Leaving Subcooler	TT_RMP_OUT	--
Temperature Entering Subcooler	TT_RCOMP_IN_MP	--
Liquid Line Temperature entering expansion device	TT_REXP_IN	7

Figure 1. Pressure-enthalpy diagram for basic refrigeration cycle, neglecting pressure losses.

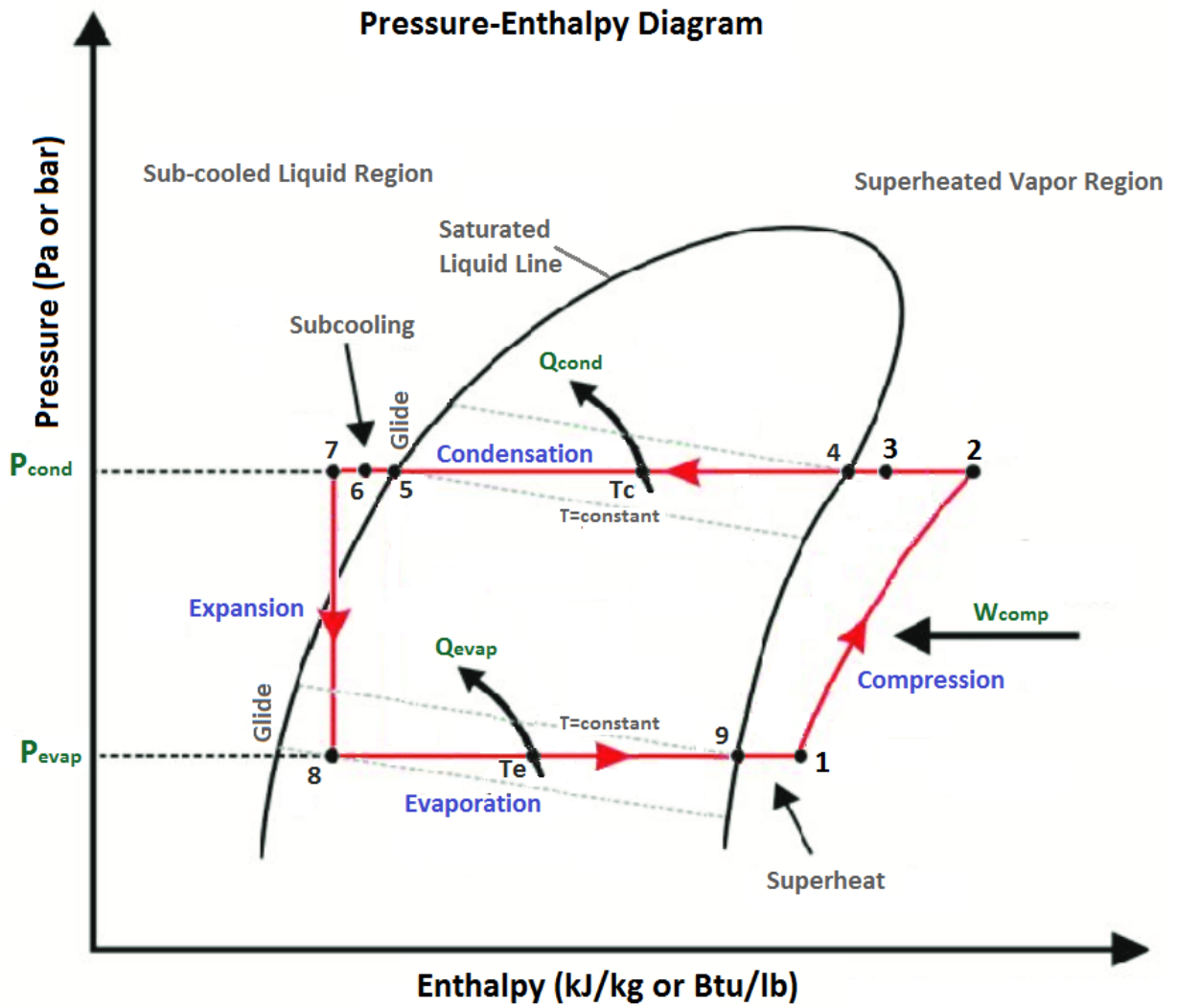


Figure 2. Circuits 16 and 17 ClimaCheck system diagram

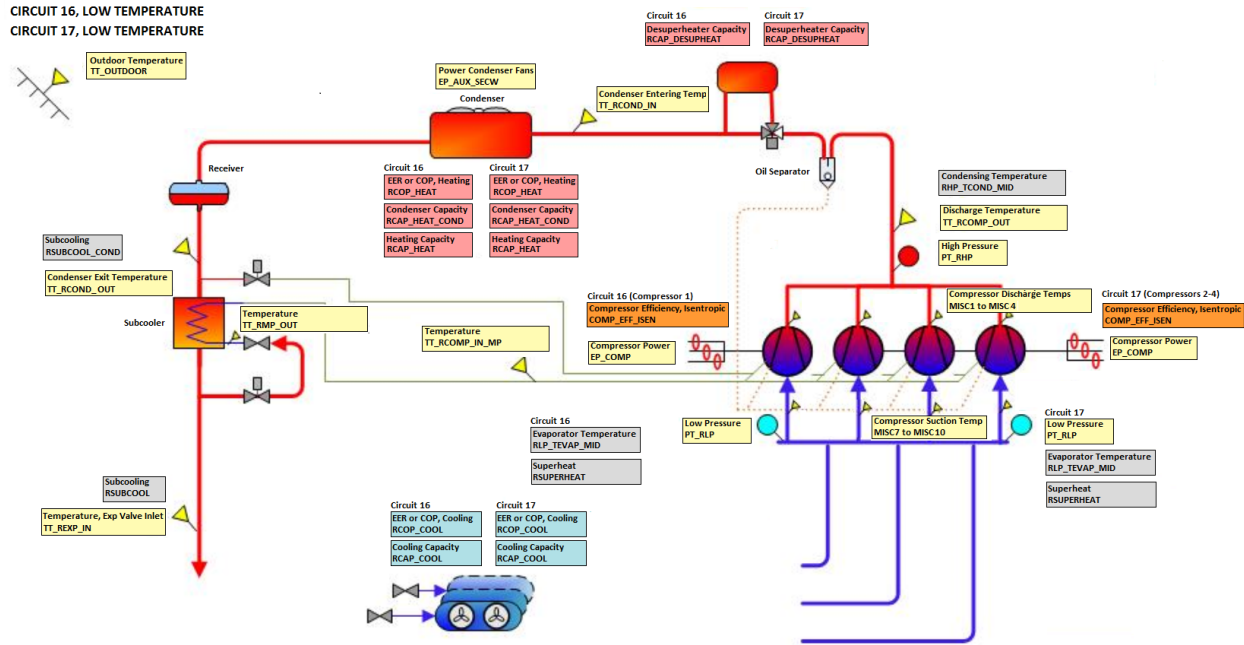


Table 2. Calculated values on Circuit 16

Calculated/Derived Values	Variable Name	Measured Temperatures Used in Calculations	Point Number/ Process
Isentropic Compressor Efficiency	COMP_EFF_ISEN	Discharge and suction manifold conditions	1 to 2
Condensing Temperature	RHP_TCOND_MID	Dew point and bubble point temperatures at PT_RHP	c
Evaporator Temperature	RLP_TEVAP_MID	Dew point and bubble point temperatures temperature at PT_RLP	e
Heating COP	RCOP_HEAT	TT_REXP_IN, Discharge and suction manifold temperatures	3 to 6
Condenser Capacity	RCAP_HEAT_COND	TT_RCOND_IN, TT_REXP_IN	
Heating Capacity	RCAP_HEAT	TT_RCOND_IN, TT_REXP_IN	
Cooling COP	RCOP_COOL	TT_RCOND_IN, TT_REXP_IN, Discharge and Suction Temperatures	8 to 1
Cooling Capacity	RCAP_COOL	TT_REXP_IN, Suction Temperatures	
Subcooling	RSUBCOOL	TT_REXP_IN, Bubble point temperature at PT_RHP	5 to 7
Superheat	RSUPERHEAT	Suction temperatures, Dew point temperature at PT_RLP	9 to 1