SCROLL LIQUID CHILLERS

Application Manual

Model NWC and NCC
15 TO 70 Tons (60 Hz)
Water Cooled and Compressor
410A Chillers

The NAPPS 410A Scroll Liquid Chiller

Compressor Design
Napps NWC and NCC standard chillers use Copeland scroll compressors. 55 million installations worldwide, 20 years of proven performance and reliability, and the lowest failure rate in the industry.

Reliability
64 percent fewer compressor parts, compared to reciprocating compressors, mean long, reliable life.

Efficiency
NWC scroll chillers meet and exceed ASHRAE Standard 90.1-2010 full and part load efficiencies. Part load efficiencies are simply unmatched by reciprocating chillers.

Control
The NAPPS MCS controller provides complete chiller control and standard interface to **BACnet IP** and **Modbus** BMS systems. **Johnson N2**, **LonTalk** or **BACnet** **MS/TP** interface optional. Door mounted display and local PC Ethernet connection provides easy access to set points and diagnostic displays. Lead/Lag control of compressor sets is. Optional factory installed hot gas bypass arrangement can also be utilized for operation at low load conditions.

Availability
Fast ship cycles on both stock and built-to-order specials.

Installation
Small unit size, factory wiring, easy lifting provisions, and start-up control logic mean quick and easy setup. Chillers fit through standard single-width door.

Operation
Smart safety features and over 60 diagnostic displays mean easy and virtually trouble-free operation.

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FEATURES AND BENEFITS

NAPPS offers state-of-the-art Water Cooled and Compressor Scroll liquid chillers for a wide range of comfort and process-cooling applications. These chillers are complete, factory-assembled chillers that offer ease of installation with wiring and microprocessor controllers providing maximum operating efficiency. These compact chillers install easily and quickly into most building layouts, making them ideal choices for retrofit or new building designs.

NAPPS Liquid Chillers
Water-cooled chillers are complete, factory-assembled liquid chillers for comfort or process-cooling applications. They multiple scroll compressors. Scroll compressors use 64 percent fewer parts compared to typical reciprocating compressors.

- Available in 8 sizes ranging from 15 to 70 nominal tons.
- Factory assembled and charged, complete with all refrigerant piping and electrical wiring. NWC models complete with refrigerant charge.
- Units ship ready to install, need only electrical and water connections.
- All components mounted in a rugged, open frame for easy access.
- Dual refrigerant circuits with dual shell-and-tube condensers on NWC 40 to 70 ton models. NWC15 to 30 models are single circuit.
- Napps highly recommends cleanable shell-and-tube condensers on open water tower applications.
- The powerful MCS controller offers complete chiller controls and provides a wealth of information and diagnostics.
- All units meet ASHRAE 90.1-2001 efficiency guidelines.
- Available in a condenserless version (Model NCC 15 to 70 tons) for use with remote air cooled condensers.

Fast Deliveries
When your project has a critical deadline, NAPPS can help. A wide range of major components are readily available so that your model can be shipped fast.

Build to Order
NAPPS can build most special models fast. Our wide array of standard options means NAPPS can provide the right chiller for the job-fast.

Installation
- One power connection hook-up for simplified fast field wiring
- The powerful MCS controller provides complete chiller controls and provides interface to a variety of platforms, including **BACnet IP** and **Modbus** as standard. **Johnson N2**, **LonTalk** and **BACnet MS/TP** require an optional interface. Optional factory installed hot gas bypass option can also be utilized.
- Units are pre-charged with oil and refrigerant (NWC) from the factory speeds installation. NCC units have the proper standard oil charge and a charge of dry nitrogen.
- Units are designed to fit thru standard doorways.
- Factory testing ensures first-time smooth operation on start-up, and reduces follow up costs.

Service
NAPPS 15 thru 70 ton scroll chillers are designed with service personnel in mind. Unit design allows replacement of all major components without complete unit teardown. All NWC units have mechanically cleanable shell and tube condensers. The MSC controller provides diagnostic capability and remote factory diagnostics to aid local and factory service personnel in analyzing problems. Unanticipated down time is minimized.

Single Source Responsibility
NAPPS markets exclusively through Trane Sales Offices, allowing the customer to provide all building comfort systems through one sales office.

Added Value Expertise
More than 50 years of NAPPS experience is engineered into our products. That means a quality product that works right, the first time!

FEATURES AND BENEFITS

Leading in Efficiency and Reliability with State-Of-The-Art Scroll Compressor Technology

ASHRAE Standard 90.1 - 2010
All NAPPS chillers meet and exceed the new efficiency levels mandated by ASHRAE Standard 90.1. This new standard requires higher efficiencies than past technologies can deliver. It mandates higher efficiency levels for scroll water chillers in comparison to reciprocating chillers. In fact, energy efficiency is so paramount, the US Federal Government has adopted standard 90.1. Federal Executive Order mandates energy consuming devices procured must be in the top 25% of their class. In the case of chillers, ASHRAE 90.1 is the product standard for measurement.

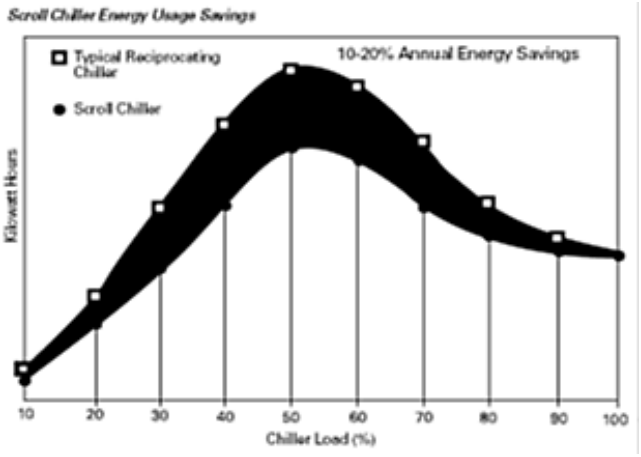
Potential Risk
Not only has ASHRAE 90.1 been adopted by the US Federal Government, it's expected to be adopted domestically, if not globally, in the future. Make sure that your chillers as well as your entire HVAC system complies, or you may be caught retrofitting your project with new equipment and paying extra design dollars if the code changes during construction.

Efficiency
The energy efficiency of the Napps scroll chiller results in energy costs lower than most other comparable chillers. Full load efficiencies are improved beyond reciprocating chillers, but part load efficiencies are simply unmatched by other manufacturers. Superior engineered efficiencies are obtained by combining advanced scroll compressor energy efficient features with up to date heat exchanger technology and state of the art controls.

Here's How
- Scroll compressor's positive displacement design
- Dual refrigerant circuits
- Multiple compressors
- Optimum system design
- Reduced friction
- No valves
- Advanced heat transfer surfaces

Reliability
The NAPPS Scroll Chiller with many new improvements features highly efficient and reliable scroll compressors.

Here's How
- Simple design with 64 percent fewer parts than equal capacity reciprocating compressor.
- Scroll compliance allows liquid and dirt to pass through without damaging compressor (liquid slugging resistant).
- Advanced microelectronics protect both compressor and motor from typical electrical fault conditions.
- Scroll compressors have less than a third the torque variations of a reciprocating compressor.
- Years of laboratory testing have optimized compressor and chiller systems reliability.
- Water-cooled scroll chillers are factory tested.



FEATURES AND BENEFITS

Hot Gas Bypass
Allows unit operation below the minimum step of unloading. The Hot Gas Bypass valve with all associated components is factory installed and tested. Hot Gas circuit is energized with last stage of cooling and regulates hot gas flow based on suction pressure. The hot gas valve is closed when there is loss of demand for cooling.

Communications
The powerful MCS controller provides complete chiller controls and provides interface to a variety of platforms, including BACnet IP and Modbus as standard. Available Johnson N2, LonTalk and BACnet MS/TP requires an optional interface.

- A diagnostic modem is available on the MCS controller.
- All units come standard with USB and Ethernet connection.
- A complete software support package is available at no charge for your PC allowing for system configuration, dynamic on-line display screens, remote communication, graphing and more.
- Controller options allow for use of additional features such as power monitoring, compressor discharge monitoring, and many other available sensors.
- Standard option available to operate low ambient dampers when an NCC model is used with remote condenser having low ambient controls. Using Napps software, this option can be very effective for low ambient air-cooled starting and operation

Central Control
Optional separate touch screen central Magnum control panel available to operate multiple NAPPS Scroll Chillers in one installation.

Ice Making Controls
In ice making mode, the unit will operate fully loaded in response to a site installed contact closure. Ice making will cease when return fluid temperature falls below a predetermined adjustable set point (minimum 20˚F). When not in ice making mode, unit will provide modulating capacity based on leaving fluid temperature (20-55˚F).

Unit Mounted Non-Fused Disconnect Switch
Available factory installed in the control panel for disconnecting main three-phase power.

Isolator Options
Seismic (Spring SLRS type) or Non-Seismic (Type Super W Neoprene type) available pre-engineered for your package (ship loose option).

Sound Attenuation
A factory-installed insulated enclosure for applications where quiet operation is required and/or factory-installed compressor sound blankets.

Water Regulating Valves
Available for controlling head pressure (factory integrated option). This **recommended** option is fully factory installed.

Lead-Lag of Compressors
Provided through software.

Flow Switch (or other factory approved flow device) Mandatory, can be factory or field supplied. Standard ship loose option available from the factory is a 1" NPT flow switch with a NEMA 4 housing.

CONTROLS

Human Interfaces
The NAPPS Scroll Chillers offer the completely integrated NAPPS MCS Magnum controller (MAGNUM) with an easy-to-use operator interface panel, LCD graphics display. The display provides a "Window" concept allowing the user to navigate the 'Window" in all directions. This advanced interface allows the user to access all information concerning Relay Outputs, Analog Outputs, Sensor Inputs, Set Points, Alarms, Service Tools, Chiller States, and Lockouts as well as graph all sensor data.

Hardware Protection
A six (6) layer microprocessor printed circuit board provides the highest level of machine reliability. Each relay output has its own snubber on both the normally open contacts and the normally closed contacts. The relay outputs are individually fused to farther protect the system from shorts. This protection is rounded out through poly fuse protection on the sensor inputs.

System Protection
A complete Safety lockout system protects the compressor operation to avoid compressor and evaporator failures, thereby eliminating over 99% of all nuisance shutdown. The MAGNUM Chiller Controls directly senses pressures, temperatures, ampere, motor faults, etc. All control variables that govern the operation of the chiller, evaporator and condenser are evaluated every second for exact control and protection. When any one of these variables approaches a limit condition where damage may occur to the unit or shutdown on a safety, the MAGNUM Chiller Controls takes corrective action to avoid shutdown and keep the chiller operating. This happens through compressor shedding.

The MAGNUM Chiller Controls optimizes total Chiller operations and operates the chiller in the most energy efficient conditions. During abnormal operating conditions, the Microprocessor will continue to optimize chiller performance by taking the corrective action necessary to avoid shutdown. This keeps cooling capacity available until the problem can be solved.

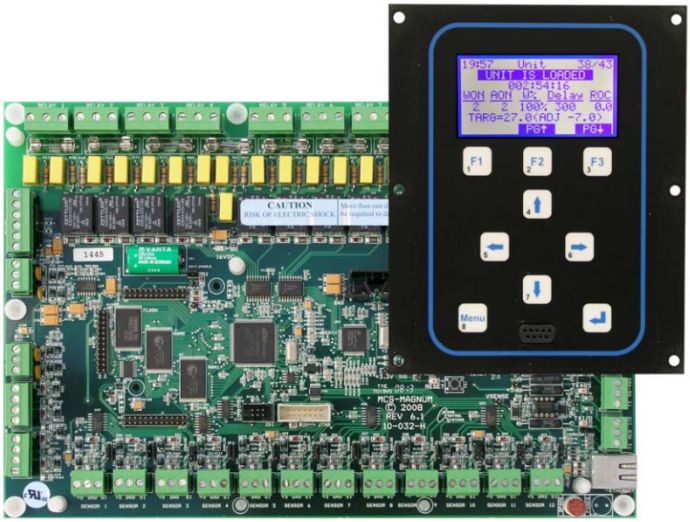


Figure 7-1 - NAPPS MCS Magnum Operator Interface

Standalone Controls
Interface to standalone units is very simple; only a remote auto/stop for scheduling is required for unit operation. Signals from the chilled water pump contactor auxiliary or a flow switch are wired to the chilled water flow interlock. Signals from a time clock or some other remote device can be wired to the external auto/stop input.

Standard Features

- **External Auto/Stop**
  A jobsite provided contact closure will turn the unit on and off.

- **Chilled Water Flow Interlock**
  A jobsite provided contact closure from a flow proving device (mandatory)

- **Emergency Stop**
  A jobsite supplied contact opening wired to this input will turn the unit off and require a manual reset of the unit microcomputer. This closure is typically triggered by a jobsite supplied system such as a fire alarm.

- **Chilled Water Pump Control (optional)**
  Unit controls can provide an output to control the chilled water pump(s). One contact closure to the chiller is all that is required to initiate the chilled water system.

- **Chilled Water Reset**
  The MAGNUM will accept an analog input from a BMS system to perform chilled water reset (Optional).

- **Condenser Control**
  Unit controls provide an output to control the condenser water pump (NWC) or condenser fan(s) (NCC). In addition, the MAGNUM allows frequency drive control of the cooling tower fan for pin point control of head pressure or damper position.

Simple Interface with Other Control Systems
Controls afford simple interface with other control systems, such as time clocks, building automation systems, and ice storage systems. This means you have the flexibility to meet job requirements while not having to learn a complicated control system. This setup has the same standard features as a stand-alone water chiller, with the possibility of having additional optional features.

Easy Interface to All Building Management Systems
Controlling the scroll chiller with building management systems is state-of-the-art, yet simple with BACnet, Modbus, Johnson N2 or LonTalk Communications Interface for Chillers. MAGNUM supports all of the standard BMS communications systems.

- **BACnet**
  BACnet is ASHRAE's standard BMS communications protocol. This allows communications between different manufacturers equipment. BACnet IP is standard, BACnet MS/TP is optional.

- **Modbus**
  Modbus is a popular communications protocol used by many manufactures to communicate to different manufactures equipment.

- **Johnson N2**
  Johnson N2 is a proprietary communication System developed for use on Johnson Controls BMS systems.

- **LonTalk**
  LonTalk is a communications protocol developed by the Echelon Corporation. The LonMark association develops control profiles using the LonTalk communication protocol.

Available Chiller Inputs:
- Chiller RUN/STOP
- Entering Liquid Temperature
- Leaving Liquid Temperature
- Circuit Disable
- Suction Circuit Pressure
- Suction Circuit Temperature
- Discharge Circuit Pressure
- Discharge Temperature (by comp)
- Circuit Amps (by comp)
- Circuit Motor Fault
- Ambient Temperature (optional)
- Evaporator Flow Status

Available Chiller Outputs:
- Compressor ON/OFF (by comp)
- Liquid Line Solenoid (by circuit)
- Condenser Pump
- Condenser Fan
- Warning
- Alarm

Analog Outputs:
Condenser Fans, Dampers, or WRV Position

Compressor Starts/Run-Times
Provides the number of starts and run times for each compressor.

Alarm Descriptor
Provides alarm messages based on predetermined criteria

Chiller Status
Indicates the running modes and states of the chiller, i.e. Loading, Unloading, Holding, High Disc PSI Hold, Low Suction Hold, In Safety, In Alarm mode, etc…

CONTROLS

Chiller Hardwire Inputs Include:

- Chiller RUN/STOP
- Circuit Enable/Disable
- External Chilled Water Reset Set point
- Compressor Lockout

Warning & Alarms
The unit provides a complete Warning / Lockout System. Please refer to the Chiller Manual for complete details.

MAGNUM Chiller Plant Control
The MAGNUM Chiller Controller allows interface to all major Building Management System communications. Please refer to 'Easy Interface to All Building Management Systems' section.

The BMS system is able to track and monitor your entire chiller plant system. All Outputs, Inputs, chiller states, Alarms, Set Points etc are provided to the BMS system for complete Chiller Status.

When multiple Chillers with MAGNUM's are installed at a single facility they can be connected via a 2 wire shielded cable. This allows the user to see all MAGNUM's from designated MAGNUM.

The MAGNUM has an Ethernet port that can be connected to a local network or assigned a permanent IP address and accessed from the internet directly.

A JAVA program allows for direct communications and access of all data.

Trending data is stored based on a user defined time. If a 10 minute sample time is specified then 7 days of data will be retained.

If additional data is required there is an optional Compact flash port available. Depending on the compact flash size selected, up to 50 years of history data can be retained.

MAGNUM Control Functions
Our chiller plant automation software is fully pre-engineered and tested. It is a standard software application, not custom programming which can prove to be difficult to support, maintain, and modify.

Energy Efficiency
The MAGNUM Chiller Controller Manager intelligently sequences starting of compressors to optimize the overall chiller plant energy efficiency. It can Lead/Lag multiple chillers without the requirement for a Plant Manager or BMS.

If the user wants a more sophisticated sequencer, the MAGNUM Plant Manager is available. MAGNUM Plant Manager can manage the most efficient chiller staging.

The MAGNUM chiller plant controller enables unique energy-saving strategies. An example is controlling pumps, and chillers from the perspective of overall system energy consumption. The software intelligently evaluates and selects the lowest energy consumption alternative.

Keeping Operators Informed
A crucial part of efficiently running a chiller plant is assuring that the operations staff is instantly aware of what is happening in the plant. The BMS interfaces provide current data to the BMS system allowing. Status screens to display current conditions.

Because all of the chiller data is supplied to the BMS system it can provide all standard reports for troubleshooting and verifying performance for each type of NAPPS chiller.

Emergency Response
We understand the importance of maintaining chilled water production while protecting your chillers from costly down time. When the MAGNUM chiller controller detects no or low water flow, the start sequence is aborted to protect the chiller. If multiple chillers are available and the LEAD / LAG option is wired the next chiller in the sequence is immediately started to maintain cooling.

Chiller Plant Automation
NAPPS' depth of experience in chillers and controls makes us a well-qualified choice for automation of chiller plants using scroll liquid chillers. The chiller plant control capabilities of the MAGNUM allow interfacing to all of the major BMS systems which is unequaled in the industry.

APPLICATION CONSIDERATIONS

Product Selection
Both NWC and NCC products are offered in 8 models each ranging in capacity from 15 to 70 nominal tons. Refer to Application Tables to select the model best suited for your application. Since actual unit capacity can vary significantly from "nominal capacity", it is important to base your selection on the actual conditions. Selection of the correct model will require attention to the minimum, as well as the full load capacity required. If the minimum capacity required is less than the minimum capacity step of the unit (refer to Application Tables), the optional hot gas bypass valve may be added to abate additional capacity. Selection of the proper equipment is an important part of a successful installation. Equipment sized too large will cycle more frequently and as a potential result lead to poor temperature and humidity control, shortened equipment life and higher utility costs. Equipment sized too small will not be able to meet peak cooling demands.

Unit location
Units should be installed indoors or protected where exposure to rain or water splash is minimal. A level foundation or flooring must be provided which will support at least 150 percent of the operating weight of the unit. Service clearance must allow for removal of compressors. All units must also allow for space to service vessels. The unit foundation must be rigid to reduce vibration transmission to a minimum. Use of optional vibration isolators is recommended for applications that are sensitive to vibration and noise.

Condenser Water Limitations
NWC Water Cooled Chiller Units start and operate satisfactorily over a wide range of load conditions. Reducing the condenser water temperature below 85°F is an effective method of lowering the power input required. Beyond certain limits, however, the effect of further reducing condenser water temperature causes a reduction in the pressure drop across the expansion valve to a point where system instability may occur.

In general, continuous machine operation with entering condenser water temperature below 75°F is not recommended. When the condenser water temperature is expected to drop below 75°F, it is recommended that some form of condenser water temperature control be used to ensure optimal machine performance. Condenser water temperatures above 95°F are not recommended except as approved by factory engineering.

Heat Recovery using condenser water is available, with applications reviewed by factory engineering. Generally, leaving water of 125°F represents the maximum limit.

Condenser Water Treatment
Use of untreated or improperly treated condenser cooling water in any water cooled condensing unit may result in tube fouling, scaling, erosion, corrosion, algae, or slime; and, as a result cause reduced performance and increase the potential for unit failure. It is recommended that the services of a qualified water treatment specialist be engaged to determine what condenser cooling water treatment and/or bleed-rate, if any, is advisable. NAPPS assumes no responsibility for the results of untreated or improperly treated water.

Water Pumps
Avoid specifying or using 3600 rpm condenser water and chilled water pumps. Such pumps may operate with objectionable noise and vibration. In addition, a low frequency beat may occur due to the slight difference in operating rpm between water pumps and the scroll compressors. Where noise and vibration-free operation is important, NAPPS encourages the use of 1750 rpm pumps.

Remote Condenser
Remote condensers should be located as close as possible to the chiller to ensure minimum pressure drops of discharge refrigerant. If non-Trane condensers are provided, a subcooling circuit must be provided in order to achieve cataloged performances (16°F [-8.9°C] subcooling).

MODEL # DESCRIPTION

Digits 1, 2, 3 - Unit Series
NCC – 410A Scroll Compressor Chiller
NWC – 410A Scroll Water-cooled Chiller

Digit 4,5 – Unit Nominal Tonnage
15-70 = nominal tons

Digit 6 - Application
S – Standard Heat Exchangers/Efficiency
H – High Efficiency Brazed Plate Condenser
For Closed Loop Applications Only

Digit 7 – Build Sequence
A – 410A Platform

Digit 8,9,10 – Component Codes
(For Factory Use)

- **8 - T, C, or O**
- **9 – A, S, or O**
- **10 – S or O**

Digit 11 – Unit Voltage
A - 208 v 3 Ø 60 Hz
B - 230 v 3 Ø 60 Hz
C - 460 v 3 Ø 60 Hz
D - 575 v 3 Ø 60 Hz
E - 200v 3 Ø 50 Hz
E - 230v 3 Ø 50 Hz
G - 380-400v 3 Ø 50 Hz
H - 500v 3 Ø 50 Hz

Digit 12 – Power Connection
T = Standard terminal block
D = Non-fused disconnect

Digit 13 – Water Regulating Valves
0 = None
1 = Factory installed valve(s)

Digit 14 – Communication Options
S = Standard BACnet/Modbus
L = LonTalk option
M = BACnet MS/TP translator option
N = Johnson N2 option

Digit 15 – Hot Gas Bypass
0 = No HGB function
1 = HGB on one circuit
2 = HGB on 2 ckts (optional for 40-60T units)

Digit 16 – Sound enclosure
0 = No Sound Enclosure Provided
1 = Factory Sound Enclosure
2 = Factory Sound Blankets
3 = Both Enclosure & Blankets

Digit 17 – Design Special
0 = No special Features
S = Special design features

Remaining Digits – Basic/Ship loose options
(Delineated with commas)
40 – 5 Yr Extended Comp. Warranty
70 – Flow Switch
100 – Neoprene Seismic Isolators
200 – Spring-type Seismic Isolators
300 – Neoprene Non-seismic Isolators
400 – Spring-type Non-seismic Isolators
500 – Aux Controller Board(s)

See sales documents, final approved submittal sheets, or packing slips for detailed shipped-loose model information

Table 12-1 General Data - NWC Water Cooled Chillers

Unit Size		15	20	26	30	40	52	60	70
Compressor									
Quantity		2	2	2	2	2,2	2,2	2,2	2,2
Nominal Tons	(tons)	7.5/7.5	10/10	13/13	15/15	10/10, 10/10	13/13, 13/13	15/15, 15/15	15/20, 15/20
Steps of Unloading	(%)	100-50	100-50	100-50	100-50	100-75-50-25	100-75-50-25	100-75-50-25	100-71-43-21
Evaporator									
Water Storage	(gal)	1.3	1.8	2.4	2.8	3.9	5.0	5.6	7.7
Minimum Flow	(gpm)	29	39	50	56	78	101	112	130
Maximum Flow	(gpm)	68	90	115	130	181	236	260	304
Condenser (each)									
Water Storage (each)	(gal)	3.1	3.1	3.6	4.4	3.1	3.6	4.4	4.4
Minimum Flow (each)	(gpm)	20	20	40	48	20	40	48	48
Maximum Flow (each)	(gpm)	65	70	135	164	70	135	164	164
General Unit									
Refrigerant		R-410A	R-410A	R-410A	R-410A	R-410A	R-410A	R-410A	R-410A
No. of Independent Refrigerant Circuits		1	1	1	1	2	2	2	2
Refr Charge per Circuit (approx.)	(lbs)	30	40	52	52	40,40	52,52	52,52	62,62
Oil Type		3MAPOE	3MAPOE	3MAPOE	3MAPOE	3MAPOE	3MAPOE	3MAPOE	3MAPOE
Oil Charge each Compressor	(oz)	81/81	110/110	110/110	110/110	110/110, 110/110	110/110, 110/110	110/110, 110/110	110/148, 110/148

Table 12-2 General Data - NCC Compressor Chillers

Unit Size		15	20	26	30	40	52	60	70
Compressor									
Quantity		2	2	2	2	2,2	2,2	2,2	2,2
Nominal Tons	(tons)	7.5/7.5	10/10	13/13	15/15	10/10, 10/10	13/13, 13/13	15/15, 15/15	15/20, 15/20
Steps of Unloading	(%)	100-50	100-50	100-50	100-50	100-75-50-25	100-75-50-25	100-75-50-25	100-71-43-21
Evaporator									
Water Storage	(gal)	1.3	1.8	2.4	2.8	3.9	5.0	5.6	7.7
Minimum Flow	(gpm)	29	39	50	56	78	101	112	130
Maximum Flow	(gpm)	68	90	115	130	181	236	260	304
General Unit									
Refrigerant		R-410A	R-410A	R-410A	R-410A	R-410A	R-410A	R-410A	R-410A
No. of Independent Refrigerant Circuits		1	1	1	1	2	2	2	2
Refr Charge per Circuit (approx.)	(lbs)	NA	NA	NA	NA	NA	NA	NA	NA
Oil Type		3MAPOE	3MAPOE	3MAPOE	3MAPOE	3MAPOE	3MAPOE	3MAPOE	3MAPOE
Oil Charge each Compressor	(oz)	81/81	110/110	110/110	110/110	110/110, 110/110	110/110, 110/110	110/110, 110/110	110/148, 110/148

Notes:

1. Data containing information on two circuits formatted as follows: Circuit 1, Circuit 2
2. Nominal compressor sizes based on 60 Hz.
3. Optional hot gas bypass feature allows additional stage of capacity reduction.

Scroll Water Cooled Chiller — (NWC) —

The chiller capacity selection table (***Table PD-1)*** on the following page is based on an ARI Standard 550/590-2003 evaporator inlet water temperature of 44 °F [6.7°C] and a flow rate of 2.4 gpm per ton. This results in a 10°F [5.6°C] temperature drop across the evaporator. Condenser flow rate for ***Table PD-1*** is set by the following formula:

gpm = 2.4 x (tons +(0.285 x compressor kW))

which results in a 10°F [5.6°C] temperature rise across the condenser.

Contact the NAPPS representative for other design points and alternate solutions to be cooled.

Scroll Compressor Chiller — (NCC) —

Scroll Compressors can be matched with remote air-cooled or water cooled condensers, or evaporative condensers. Contact the NAPPS representative for performance rates to meet your duty requirements.

Note that Napps 410A NCC chillers operate at much higher pressures than traditional R22 chillers. Piping ratings must be carefully evaluated when designing field piping systems for 410A.

Table 14-1 Performance Data - NWC15 Water Cooled Chiller

	Entering Condenser Water Temperature																				
	65							70							75						
Evap				Evap		Cond					Evap		Cond					Evap		Cond	
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP
40	16.4	9.2	20.8	39.5	11.3	49.3	10.1	16.0	9.8	19.0	38.3	10.8	47.9	9.4	15.5	10.4	17.5	37.3	10.3	46.6	8.9
42	17.1	9.2	21.5	40.9	12.1	51.2	10.8	16.6	9.8	19.7	39.8	11.5	49.7	10.1	16.1	10.4	18.1	38.7	10.9	48.3	9.5
44	17.7	9.2	22.2	42.4	12.9	53.1	11.5	17.2	9.8	20.4	41.2	12.3	51.5	10.8	16.7	10.4	18.7	40.1	11.7	50.1	10.1
46	18.3	9.3	23.0	44.0	13.8	55.0	12.3	17.8	9.8	21.1	42.8	13.1	53.5	11.5	17.3	10.4	19.4	41.6	12.5	52.0	10.8
48	19.0	9.3	23.8	45.7	14.8	57.1	13.1	18.5	9.9	21.8	44.4	14.0	55.4	12.3	18.0	10.5	20.0	43.1	13.3	53.9	11.5

	Entering Condenser Water Temperature																				
	80							85							90						
Evap				Evap		Cond					Evap		Cond					Evap		Cond	
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP
40	15.1	11.0	16.1	36.2	9.7	45.3	8.3	14.7	11.6	14.8	35.2	9.2	44.0	7.8	14.2	12.3	13.6	34.1	8.8	42.7	7.3
42	15.7	11.0	16.6	37.6	10.4	47.0	8.9	15.2	11.6	15.3	36.5	9.9	45.6	8.3	14.7	12.3	14.0	35.4	9.3	44.2	7.8
44	16.2	11.0	17.2	39.0	11.1	48.7	9.5	15.8	11.7	15.8	37.9	10.5	47.3	8.9	15.3	12.3	14.5	36.7	10.0	45.9	8.3
46	16.8	11.0	17.8	40.4	11.8	50.5	10.1	16.4	11.7	16.4	39.2	11.2	49.0	9.5	15.9	12.4	15.1	38.1	10.6	47.6	8.9
48	17.5	11.1	18.4	41.9	12.6	52.4	10.8	16.9	11.7	16.9	40.6	12.0	50.8	10.1	16.5	12.4	15.6	39.5	11.4	49.4	9.5

	Entering Condenser Water Temperature																				
	95							100							105						
Evap				Evap		Cond					Evap		Cond					Evap		Cond	
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP
40	13.8	13.0	12.4	33.0	8.3	41.3	6.8	13.3	13.8	11.3	32.0	7.8	40.0	6.3	12.9	14.6	10.3	30.9	7.3	38.6	5.9
42	14.3	13.0	12.9	34.3	8.8	42.9	7.3	13.8	13.8	11.8	33.2	8.3	41.4	6.8	13.3	14.7	10.7	32.0	7.8	40.0	6.3
44	14.8	13.1	13.3	35.6	9.4	44.5	7.8	14.3	13.8	12.2	34.4	8.9	43.0	7.2	13.8	14.7	11.1	33.2	8.3	41.5	6.7
46	15.4	13.1	13.8	36.9	10.1	46.1	8.3	14.9	13.8	12.6	35.7	9.5	44.6	7.7	14.3	14.7	11.5	34.4	8.9	43.0	7.2
48	15.9	13.1	14.3	38.3	10.7	47.8	8.8	15.4	13.9	13.1	37.0	10.1	46.3	8.2	14.9	14.7	11.9	35.7	9.5	44.7	7.7

Notes:

1. Rated in accordance with ARI Standard 550/590-2010 with
   - Water-side fouling factor allowance of 0.0001 hr-ft^2-°F/BTU for evaporator and 0.00025 hr-ft^2-°F/BTU for condenser.
   - Test tolerance at full load for capacity, input power and EER = ± 5%.
2. Ratings are based on a 10°F temperature drop in evaporator and a 10°F temperature rise in condenser.
3. Flow = Water-side flowrate in gpm.
4. 100% of the condenser flow will pass through single condensers on NWC15, 20, 26 and 30 models.
5. 50% of the condenser flow will pass through each of two condensers on NWC40, 52, 60 and 70 models.
6. DP = Water-side pressure drop in feet of water.
7. kW = Power input for compressors only.
8. EER = Energy Efficiency Ratio (cooling capacity in BTUH divided by total power input in watts).
9. Interpolation between points is permissible. Extrapolation is not permitted.
10. Consult NAPPS for performance at special conditions.

FULL LOAD PERFORMANCE DATA

Table 15-1 Performance Data - NWC20 Water Cooled Chiller

	Entering Condenser Water Temperature																						
	65							70							75								
Evap				Evap		Cond					Evap		Cond					Evap		Cond			
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP		
40	22.1	12.9	20.0	52.7	12.7	61.9	15.1	21.6	13.4	19.0	51.7	12.2	61.2	14.6	21.1	13.9	17.8	50.5	11.7	60.4	14.1		
42	22.8	13.0	20.6	54.5	13.5	63.7	15.9	22.3	13.4	19.5	53.4	13.0	62.9	15.4	21.8	14.0	18.4	52.2	12.4	62.2	14.9		
44	23.5	13.0	21.2	56.3	14.3	65.4	16.7	23.1	13.5	20.1	55.2	13.8	64.7	16.2	22.6	14.0	18.9	54.0	13.2	64.0	15.7		
46	24.3	13.1	21.8	58.1	15.2	67.2	17.6	23.8	13.5	20.7	57.0	14.6	66.6	17.0	23.3	14.1	19.5	55.8	14.1	65.8	16.5		
48	25.0	13.1	22.4	59.9	16.1	69.1	18.5	24.6	13.6	21.3	58.8	15.5	68.4	17.9	24.1	14.1	20.1	57.7	15.0	67.7	17.4		

	Entering Condenser Water Temperature																						
	80							85							90								
Evap				Evap		Cond					Evap		Cond					Evap		Cond			
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP		
40	20.6	14.6	16.6	49.2	11.1	59.6	13.6	20.0	15.3	15.4	47.8	10.6	58.8	13.2	19.4	16.2	14.2	46.4	10.0	58.0	12.7		
42	21.3	14.6	17.2	50.9	11.9	61.4	14.4	20.7	15.4	15.9	49.5	11.3	60.6	13.9	20.1	16.2	14.6	48.1	10.7	59.7	13.4		
44	22.0	14.7	17.7	52.7	12.6	63.2	15.1	21.5	15.4	16.4	51.3	12.0	62.4	14.6	20.8	16.3	15.1	49.8	11.4	61.5	14.1		
46	22.8	14.7	18.2	54.6	13.5	65.1	16.0	22.2	15.5	16.9	53.1	12.8	64.2	15.4	21.6	16.3	15.6	51.6	12.2	63.3	14.9		
48	23.6	14.8	18.8	56.4	14.4	66.9	16.8	23.0	15.5	17.4	55.0	13.7	66.1	16.2	22.3	16.4	16.1	53.5	13.0	65.2	15.7		

	Entering Condenser Water Temperature																						
	95							100							105								
Evap				Evap		Cond					Evap		Cond					Evap		Cond			
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP		
40	18.8	17.1	12.9	44.8	9.4	57.1	12.2	18.1	18.2	11.8	43.2	8.8	56.3	11.7	17.4	19.3	10.6	41.5	8.1	55.3	11.3		
42	19.4	17.2	13.4	46.5	10.0	58.8	12.9	18.8	18.2	12.2	44.9	9.4	57.9	12.4	18.0	19.4	11.0	43.1	8.7	57.0	11.9		
44	20.2	17.2	13.8	48.2	10.7	60.6	13.6	19.5	18.3	12.6	46.5	10.0	59.6	13.1	18.7	19.4	11.4	44.8	9.3	58.7	12.6		
46	20.9	17.3	14.3	50.0	11.4	62.4	14.3	20.2	18.3	13.0	48.3	10.7	61.4	13.8	19.4	19.4	11.8	46.5	10.0	60.4	13.3		
48	21.6	17.3	14.8	51.8	12.2	64.2	15.1	20.9	18.3	13.5	50.1	11.5	63.2	14.6	20.2	19.5	12.2	48.3	10.7	62.2	14.0		

Notes:

1. Rated in accordance with ARI Standard 550/590-2010 with
   - Water-side fouling factor allowance of 0.0001 hr-ft^2-°F/BTU for evaporator and 0.00025 hr-ft^2-°F/BTU for condenser.
   - Test tolerance at full load for capacity, input power and EER = ± 5%.
2. Ratings are based on a 10°F temperature drop in evaporator and a 10°F temperature rise in condenser.
3. Flow = Water-side flowrate in gpm.
4. 100% of the condenser flow will pass through single condensers on NWC15, 20, 26 and 30 models.
5. 50% of the condenser flow will pass through each of two condensers on NWC40, 52, 60 and 70 models.
6. DP = Water-side pressure drop in feet of water.
7. kW = Power input for compressors only.
8. EER = Energy Efficiency Ratio (cooling capacity in BTUH divided by total power input in watts).
9. Interpolation between points is permissible. Extrapolation is not permitted.
10. Consult NAPPS for performance at special conditions.

Table 16-1 Performance Data - NWC26 Water Cooled Chiller

	Entering Condenser Water Temperature																				
	65							70							75						
Evap				Evap		Cond					Evap		Cond					Evap		Cond	
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP
40	27.4	16.4	19.8	65.5	13.5	77.1	4.2	26.7	17.2	18.3	63.9	12.8	76.1	4.1	26.0	18.1	17.0	62.2	12.2	75.1	3.9
42	28.4	16.5	20.3	68.0	14.4	79.6	4.5	27.7	17.3	18.9	66.2	13.7	78.5	4.3	27.0	18.2	17.5	64.5	13.1	77.5	4.2
44	29.5	16.6	20.9	70.4	15.4	82.1	4.8	28.7	17.4	19.4	68.6	14.7	81.0	4.6	28.0	18.3	18.0	66.9	14.0	79.9	4.4
46	30.5	16.8	21.5	73.0	16.5	84.8	5.0	29.8	17.6	20.0	71.2	15.8	83.6	4.8	29.0	18.4	18.6	69.3	15.0	82.5	4.7
48	31.6	16.9	22.1	75.7	17.7	87.6	5.3	30.8	17.7	20.6	73.8	16.9	86.3	5.1	30.0	18.6	19.1	71.9	16.0	85.1	4.9

	Entering Condenser Water Temperature																				
	80							85							90						
Evap				Evap		Cond					Evap		Cond					Evap		Cond	
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP
40	25.4	19.0	15.7	60.6	11.6	74.2	3.8	24.7	20.1	14.5	58.9	11.0	73.3	3.7	23.9	21.1	13.4	57.2	10.4	72.3	3.6
42	26.3	19.1	16.2	62.8	12.4	76.5	4.0	25.6	20.2	15.0	61.1	11.8	75.5	3.9	24.8	21.2	13.8	59.3	11.1	74.5	3.7
44	27.2	19.3	16.7	65.1	13.3	78.8	4.2	26.5	20.3	15.4	63.3	12.6	77.7	4.1	25.7	21.4	14.2	61.4	11.9	76.7	3.9
46	28.2	19.4	17.2	67.4	14.2	81.3	4.5	27.4	20.4	15.9	65.6	13.5	80.2	4.3	26.6	21.5	14.7	63.7	12.7	79.0	4.2
48	29.2	19.5	17.7	69.9	15.2	83.7	4.7	28.4	20.5	16.4	68.0	14.4	82.6	4.6	27.5	21.6	15.1	65.9	13.6	81.4	4.4

	Entering Condenser Water Temperature																				
	95							100							105						
Evap				Evap		Cond					Evap		Cond					Evap		Cond	
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP
40	23.2	22.3	12.3	55.4	9.8	71.4	3.4	22.4	23.5	11.3	53.5	9.2	70.3	3.3	21.6	24.9	10.3	51.6	8.6	69.4	3.2
42	24.0	22.4	12.7	57.4	10.5	73.5	3.6	23.2	23.6	11.6	55.4	9.8	72.4	3.5	22.4	25.0	10.6	53.5	9.2	71.3	3.4
44	24.9	22.5	13.1	59.5	11.2	75.6	3.8	24.0	23.7	12.0	57.5	10.5	74.5	3.7	23.2	25.1	11.0	55.4	9.8	73.3	3.5
46	25.8	22.6	13.5	61.7	12.0	77.9	4.0	24.9	23.8	12.4	59.6	11.3	76.7	3.9	24.0	25.2	11.3	57.4	10.5	75.4	3.7
48	26.7	22.7	13.9	63.9	12.8	80.2	4.2	25.8	24.0	12.8	61.8	12.0	78.9	4.1	24.9	25.3	11.7	59.5	11.2	77.6	3.9

Notes:

1. Rated in accordance with ARI Standard 550/590-2010 with
   - Water-side fouling factor allowance of 0.0001 hr-ft^2-°F/BTU for evaporator and 0.00025 hr-ft^2-°F/BTU for condenser.
   - Test tolerance at full load for capacity, input power and EER = ± 5%.
2. Ratings are based on a 10°F temperature drop in evaporator and a 10°F temperature rise in condenser.
3. Flow = Water-side flowrate in gpm.
4. 100% of the condenser flow will pass through single condensers on NWC15, 20, 26 and 30 models.
5. 50% of the condenser flow will pass through each of two condensers on NWC40, 52, 60 and 70 models.
6. DP = Water-side pressure drop in feet of water.
7. kW = Power input for compressors only.
8. EER = Energy Efficiency Ratio (cooling capacity in BTUH divided by total power input in watts).
9. Interpolation between points is permissible. Extrapolation is not permitted.
10. Consult NAPPS for performance at special conditions.

FULL LOAD PERFORMANCE DATA

Table 17-1 Performance Data - NWC30 Water Cooled Chiller

	Entering Condenser Water Temperature																				
	65							70							75						
Evap				Evap		Cond					Evap		Cond					Evap		Cond	
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP
40	31.5	19.7	18.9	75.3	10.8	89.2	5.5	30.9	20.6	17.7	73.8	10.4	88.4	5.4	30.2	21.6	16.6	72.1	10.0	87.4	5.2
42	32.6	19.9	19.4	77.9	11.5	92.0	5.8	32.0	20.8	18.2	76.4	11.1	91.1	5.7	31.2	21.7	17.0	74.7	10.7	90.1	5.5
44	33.8	20.1	19.8	80.7	12.3	94.9	6.1	33.1	21.0	18.7	79.1	11.8	93.9	6.0	32.3	21.9	17.5	77.3	11.4	92.9	5.8
46	34.9	20.3	20.3	83.5	13.1	97.8	6.5	34.2	21.2	19.1	81.9	12.6	96.8	6.3	33.5	22.1	17.9	80.0	12.1	95.7	6.1
48	36.1	20.5	20.8	86.5	14.0	100.8	6.9	35.4	21.4	19.6	84.7	13.5	99.8	6.6	34.6	22.3	18.4	82.8	12.9	98.6	6.4

	Entering Condenser Water Temperature																				
	80							85							90						
Evap				Evap		Cond					Evap		Cond					Evap		Cond	
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP
40	29.4	22.6	15.4	70.3	9.5	86.4	5.0	28.7	23.7	14.3	68.5	9.1	85.4	4.8	27.8	24.9	13.2	66.5	8.6	84.4	4.7
42	30.5	22.7	15.9	72.8	10.2	89.0	5.3	29.7	23.9	14.7	70.9	9.7	88.0	5.1	28.8	25.1	13.6	68.9	9.2	86.9	4.9
44	31.5	22.9	16.3	75.4	10.8	91.7	5.6	30.7	24.0	15.2	73.5	10.3	90.6	5.4	29.8	25.2	14.0	71.4	9.8	89.4	5.2
46	32.6	23.1	16.7	78.1	11.6	94.5	5.9	31.8	24.2	15.6	76.1	11.0	93.4	5.7	30.9	25.4	14.4	73.9	10.5	92.1	5.5
48	33.8	23.3	17.2	80.9	12.3	97.4	6.2	32.9	24.4	16.0	78.7	11.8	96.1	6.0	32.0	25.6	14.8	76.6	11.2	94.9	5.8

	Entering Condenser Water Temperature																				
	95							100							105						
Evap				Evap		Cond					Evap		Cond					Evap		Cond	
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP
40	27.0	26.2	12.2	64.4	8.1	83.2	4.5	26.1	27.7	11.2	62.3	7.6	82.1	4.3	25.1	29.2	10.2	60.0	7.1	80.8	4.2
42	27.9	26.4	12.6	66.8	8.7	85.7	4.8	27.0	27.8	11.5	64.6	8.2	84.5	4.6	26.0	29.3	10.5	62.1	7.6	83.1	4.4
44	28.9	26.5	12.9	69.2	9.2	88.2	5.0	28.0	27.9	11.9	66.9	8.7	86.9	4.8	26.9	29.4	10.9	64.4	8.1	85.5	4.6
46	30.0	26.7	13.3	71.7	9.9	90.8	5.3	29.0	28.1	12.2	69.3	9.3	89.4	5.1	27.9	29.6	11.2	66.8	8.7	87.9	4.9
48	31.0	26.9	13.7	74.3	10.6	93.5	5.6	30.0	28.3	12.6	71.8	9.9	92.0	5.3	28.9	29.8	11.5	69.2	9.3	90.4	5.1

Notes:

1. Rated in accordance with ARI Standard 550/590-2010 with
   - Water-side fouling factor allowance of 0.0001 hr-ft^2-°F/BTU for evaporator and 0.00025 hr-ft^2-°F/BTU for condenser.
   - Test tolerance at full load for capacity, input power and EER = ± 5%.
2. Ratings are based on a 10°F temperature drop in evaporator and a 10°F temperature rise in condenser.
3. Flow = Water-side flowrate in gpm.
4. 100% of the condenser flow will pass through single condensers on NWC15, 20, 26 and 30 models.
5. 50% of the condenser flow will pass through each of two condensers on NWC40, 52, 60 and 70 models.
6. DP = Water-side pressure drop in feet of water.
7. kW = Power input for compressors only.
8. EER = Energy Efficiency Ratio (cooling capacity in BTUH divided by total power input in watts).
9. Interpolation between points is permissible. Extrapolation is not permitted.
10. Consult NAPPS for performance at special conditions.

Table 18-1 Performance Data - NWC40 Water Cooled Chiller

	Entering Condenser Water Temperature																						
	65							70							75								
Evap				Evap		Cond					Evap		Cond					Evap		Cond			
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP		
40	44.1	25.8	20.3	105.4	9.3	123.7	15.1	43.3	26.7	19.2	103.4	9.0	122.4	14.6	42.3	27.8	18.1	101.1	8.6	121.0	14.2		
42	45.6	25.9	20.9	109.0	9.9	127.3	15.9	44.7	26.8	19.8	106.9	9.5	126.0	15.4	43.8	27.9	18.6	104.6	9.2	124.6	14.9		
44	47.1	26.0	21.5	112.7	10.5	131.0	16.8	46.2	26.9	20.4	110.6	10.1	129.7	16.2	45.3	28.0	19.2	108.3	9.7	128.3	15.7		
46	48.7	26.1	22.1	116.4	11.1	134.8	17.6	47.8	27.0	21.0	114.4	10.8	133.5	17.1	46.9	28.1	19.8	112.1	10.4	132.2	16.6		
48	50.2	26.2	22.8	120.3	11.8	138.7	18.6	49.4	27.1	21.6	118.3	11.4	137.4	18.0	48.5	28.2	20.4	116.0	11.0	136.1	17.5		

	Entering Condenser Water Temperature																						
	80							85							90								
Evap				Evap		Cond					Evap		Cond					Evap		Cond			
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP		
40	41.3	29.1	16.8	98.6	8.2	119.4	13.7	40.1	30.6	15.6	95.8	7.8	117.8	13.2	38.9	32.3	14.3	92.9	7.4	116.2	12.7		
42	42.7	29.2	17.4	102.2	8.8	123.1	14.4	41.6	30.7	16.1	99.4	8.3	121.4	13.9	40.3	32.4	14.8	96.4	7.9	119.7	13.4		
44	44.3	29.3	17.9	105.9	9.3	126.8	15.3	43.1	30.8	16.6	103.0	8.9	125.1	14.7	41.8	32.5	15.3	100.1	8.5	123.4	14.2		
46	45.8	29.4	18.5	109.6	10.0	130.7	16.1	44.7	30.9	17.2	106.8	9.5	129.0	15.6	43.4	32.6	15.8	103.8	9.0	127.3	15.0		
48	47.4	29.5	19.1	113.6	10.6	134.6	17.0	46.3	31.0	17.7	110.7	10.1	132.9	16.4	45.0	32.7	16.4	107.7	9.6	131.2	15.9		

	Entering Condenser Water Temperature																						
	95							100							105								
Evap				Evap		Cond					Evap		Cond					Evap		Cond			
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP		
40	37.6	34.2	13.1	89.9	7.0	114.5	12.3	36.3	36.3	11.9	86.8	6.6	112.8	11.8	34.9	38.7	10.7	83.3	6.1	111.0	11.4		
42	39.0	34.3	13.5	93.3	7.5	117.9	12.9	37.7	36.4	12.3	90.0	7.0	116.2	12.5	36.2	38.7	11.1	86.6	6.5	114.3	12.0		
44	40.5	34.4	14.0	96.8	8.0	121.6	13.7	39.1	36.5	12.8	93.5	7.5	119.7	13.2	37.6	38.8	11.5	89.9	7.0	117.7	12.7		
46	42.0	34.5	14.5	100.6	8.5	125.4	14.5	40.6	36.6	13.2	97.1	8.0	123.3	13.9	39.1	38.9	12.0	93.5	7.5	121.4	14.5		
48	43.6	34.6	15.0	104.3	9.1	129.2	15.3	42.1	36.7	13.7	100.8	8.6	127.1	14.7	40.6	39.0	12.4	97.2	8.0	125.1	14.2		

Notes:

1. Rated in accordance with ARI Standard 550/590-2010 with
   - Water-side fouling factor allowance of 0.0001 hr-ft^2-°F/BTU for evaporator and 0.00025 hr-ft^2-°F/BTU for condenser.
   - Test tolerance at full load for capacity, input power and EER = ± 5%.
2. Ratings are based on a 10°F temperature drop in evaporator and a 10°F temperature rise in condenser.
3. Flow = Water-side flowrate in gpm.
4. 100% of the condenser flow will pass through single condensers on NWC15, 20, 26 and 30 models.
5. 50% of the condenser flow will pass through each of two condensers on NWC40, 52, 60 and 70 models.
6. DP = Water-side pressure drop in feet of water.
7. kW = Power input for compressors only.
8. EER = Energy Efficiency Ratio (cooling capacity in BTUH divided by total power input in watts).
9. Interpolation between points is permissible. Extrapolation is not permitted.
10. Consult NAPPS for performance at special conditions.

FULL LOAD PERFORMANCE DATA

Table 19-1 Performance Data - NWC52 Water Cooled Chiller

	Entering Condenser Water Temperature																						
	65							70							75								
Evap				Evap		Cond					Evap		Cond					Evap		Cond			
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP		
40	54.7	32.7	19.9	130.6	10.7	153.7	4.2	53.3	34.3	18.5	127.4	10.2	151.8	4.1	52.0	36.1	17.1	124.1	9.8	149.9	3.9		
42	56.7	32.9	20.5	135.6	11.5	158.9	4.5	55.3	34.6	19.0	132.2	11.0	156.8	4.3	53.9	36.4	17.7	128.9	10.5	154.8	4.2		
44	58.9	33.2	21.1	140.7	12.3	164.1	4.7	57.4	34.8	19.6	137.2	11.7	161.9	4.6	55.9	36.6	18.2	133.8	11.2	159.9	4.4		
46	61.1	33.5	21.7	146.1	13.2	169.7	5.0	59.6	35.1	20.2	142.6	12.6	167.4	4.8	58.1	36.9	18.8	138.9	12.0	165.1	4.7		
48	63.4	33.8	22.3	151.7	14.1	175.4	5.3	61.8	35.4	20.8	148.0	13.5	173.0	5.1	60.3	37.1	19.3	144.2	12.9	170.6	5.0		

	Entering Condenser Water Temperature																						
	80							85							90								
Evap				Evap		Cond					Evap		Cond					Evap		Cond			
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP		
40	50.6	38.0	15.9	121.0	9.3	148.2	3.8	49.3	40.1	14.6	117.7	8.9	146.4	3.7	47.8	42.2	13.5	114.3	8.4	144.6	3.6		
42	52.5	38.3	16.3	125.5	10.0	152.8	4.0	51.1	40.3	15.1	122.1	9.5	150.9	3.9	49.6	42.5	13.9	118.5	9.0	148.9	3.7		
44	54.5	38.5	16.8	130.2	10.7	157.7	4.2	53.0	40.5	15.6	126.6	10.1	155.6	4.1	51.4	42.7	14.4	122.9	9.6	153.5	3.9		
46	56.5	38.7	17.4	135.2	11.4	162.8	4.5	55.0	40.8	16.1	131.6	10.9	160.7	4.3	53.3	42.9	14.8	127.6	10.3	158.4	4.2		
48	58.6	39.0	17.9	140.3	12.2	168.0	4.8	57.0	41.0	16.6	136.6	11.6	165.8	4.6	55.3	43.1	15.3	132.4	11.0	163.3	4.4		

	Entering Condenser Water Temperature																						
	95							100							105								
Evap				Evap		Cond					Evap		Cond					Evap		Cond			
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP		
40	46.4	44.6	12.4	110.9	8.0	142.8	3.4	44.8	47.1	11.4	107.1	7.5	140.9	3.3	43.3	49.7	10.4	103.5	7.0	139.1	3.2		
42	48.1	44.8	12.8	115.0	8.5	147.1	3.6	46.5	47.3	11.7	111.1	8.0	145.0	3.5	44.9	49.9	10.7	107.2	7.5	142.9	3.4		
44	49.8	45.0	13.2	119.1	9.1	151.4	3.8	48.2	47.5	12.1	115.3	8.5	149.3	3.7	46.5	50.1	11.1	111.2	8.0	147.0	3.5		
46	51.7	45.2	13.6	123.6	9.7	156.0	4.0	50.0	47.7	12.5	119.6	9.1	153.7	3.9	48.2	50.3	11.4	115.3	8.5	151.3	3.7		
48	53.6	45.5	14.1	128.3	10.4	160.8	4.2	51.8	47.9	12.9	124.1	9.8	158.4	4.1	49.9	50.6	11.8	119.6	9.1	155.7	3.9		

Notes:

1. Rated in accordance with ARI Standard 550/590-2010 with
   - Water-side fouling factor allowance of 0.0001 hr-ft^2-°F/BTU for evaporator and 0.00025 hr-ft^2-°F/BTU for condenser.
   - Test tolerance at full load for capacity, input power and EER = ± 5%.
2. Ratings are based on a 10°F temperature drop in evaporator and a 10°F temperature rise in condenser.
3. Flow = Water-side flowrate in gpm.
4. 100% of the condenser flow will pass through single condensers on NWC15, 20, 26 and 30 models.
5. 50% of the condenser flow will pass through each of two condensers on NWC40, 52, 60 and 70 models.
6. DP = Water-side pressure drop in feet of water.
7. kW = Power input for compressors only.
8. EER = Energy Efficiency Ratio (cooling capacity in BTUH divided by total power input in watts).
9. Interpolation between points is permissible. Extrapolation is not permitted.
10. Consult NAPPS for performance at special conditions.

Table 20-1 Performance Data - NWC60 Water Cooled Chiller

	Entering Condenser Water Temperature																						
	65							70							75								
Evap				Evap		Cond					Evap		Cond					Evap		Cond			
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP		
40	62.9	39.4	19.0	150.4	13.0	178.2	5.5	61.7	41.2	17.9	147.5	12.5	176.7	5.3	60.3	43.1	16.7	144.1	11.9	174.8	5.2		
42	65.2	39.8	19.5	155.8	13.9	183.9	5.8	63.9	41.5	18.3	152.8	13.4	182.3	5.7	62.5	43.4	17.2	149.5	12.8	180.4	5.5		
44	67.5	40.2	20.0	161.5	14.9	189.7	6.1	66.2	41.9	18.8	158.3	14.3	188.0	6.0	64.8	43.8	17.6	154.9	13.7	186.0	5.8		
46	69.9	40.6	20.5	167.3	16.0	195.8	6.5	68.6	42.3	19.3	164.1	15.4	193.9	6.3	67.1	44.2	18.1	160.5	14.7	191.9	6.1		
48	72.4	41.0	21.0	173.3	17.1	202.1	6.9	71.0	42.7	19.8	169.9	16.5	200.1	6.7	69.5	44.6	18.6	166.3	15.8	197.9	6.5		

	Entering Condenser Water Temperature																						
	80							85							90								
Evap				Evap		Cond					Evap		Cond					Evap		Cond			
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP		
40	58.8	45.1	15.5	140.5	11.3	172.8	6.3	57.3	47.4	14.4	136.9	10.8	170.8	4.8	55.7	49.8	13.3	133.0	10.2	168.7	4.7		
42	60.9	45.5	16.0	145.6	12.2	178.1	5.3	59.4	47.7	14.8	141.9	11.6	176.1	5.1	57.7	50.1	13.7	137.9	10.9	173.8	4.9		
44	63.2	45.8	16.4	151.1	13.1	183.7	5.6	61.5	48.0	15.3	147.2	12.4	181.5	5.4	59.8	50.5	14.1	142.9	11.7	179.1	5.2		
46	65.5	46.2	16.9	156.6	14.0	189.5	5.9	63.8	48.4	15.7	152.6	13.3	187.2	5.7	62.0	50.8	14.6	148.3	12.6	184.6	5.5		
48	67.8	46.6	17.4	162.4	15.1	195.5	6.2	66.1	48.8	16.2	158.2	14.3	193.0	6.0	64.3	51.2	15.0	153.9	13.5	190.5	5.8		

	Entering Condenser Water Temperature																						
	95							100							105								
Evap				Evap		Cond					Evap		Cond					Evap		Cond			
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP		
40	53.9	52.5	12.3	128.9	9.6	166.5	4.5	52.2	55.3	11.3	124.7	9.0	164.3	4.4	50.3	58.4	10.3	120.2	8.4	161.9	4.2		
42	55.9	52.7	12.7	133.7	10.3	171.5	4.8	54.1	55.6	11.6	129.3	9.6	169.1	4.6	52.1	58.6	10.6	124.6	9.0	166.5	4.4		
44	58.0	53.1	13.0	138.6	11.0	176.7	5.0	56.1	55.9	12.0	134.0	10.3	174.0	4.8	54.0	58.9	10.9	129.1	9.6	171.2	4.6		
46	60.1	53.4	13.4	143.8	11.9	182.1	5.3	58.1	56.2	12.3	139.0	11.1	179.3	5.1	56.0	59.2	11.3	133.9	10.3	176.2	4.9		
48	62.3	53.8	13.8	149.1	12.7	187.6	5.6	60.2	56.5	12.7	144.2	11.9	184.6	5.4	58.0	59.5	11.6	138.8	11.1	181.4	5.1		

Notes:

1. Rated in accordance with ARI Standard 550/590-2010 with
   - Water-side fouling factor allowance of 0.0001 hr-ft^2-°F/BTU for evaporator and 0.00025 hr-ft^2-°F/BTU for condenser.
   - Test tolerance at full load for capacity, input power and EER = ± 5%.
2. Ratings are based on a 10°F temperature drop in evaporator and a 10°F temperature rise in condenser.
3. Flow = Water-side flowrate in gpm.
4. 100% of the condenser flow will pass through single condensers on NWC15, 20, 26 and 30 models.
5. 50% of the condenser flow will pass through each of two condensers on NWC40, 52, 60 and 70 models.
6. DP = Water-side pressure drop in feet of water.
7. kW = Power input for compressors only.
8. EER = Energy Efficiency Ratio (cooling capacity in BTUH divided by total power input in watts).
9. Interpolation between points is permissible. Extrapolation is not permitted.
10. Consult NAPPS for performance at special conditions.

FULL LOAD PERFORMANCE DATA

Table 21-1 Performance Data - NWC70 Water Cooled Chiller

	Entering Condenser Water Temperature																						
	65							70							75								
Evap				Evap		Cond					Evap		Cond					Evap		Cond			
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP		
40	73.9	44.9	19.6	176.7	19.6	208.4	5.1	72.0	47.0	18.3	172.0	18.6	205.4	4.9	70.0	49.2	17.0	167.2	17.6	202.3	4.7		
42	76.7	45.2	20.3	183.4	21.0	215.2	5.4	74.7	47.3	18.8	178.6	20.0	212.1	5.2	72.6	49.5	17.5	173.7	18.9	209.0	5.0		
44	79.5	45.4	20.9	190.2	22.6	222.2	5.7	77.5	47.5	19.4	185.3	21.5	219.0	5.5	75.4	49.8	18.1	180.3	20.3	215.8	5.3		
46	82.4	45.6	21.6	197.3	24.2	229.3	6.1	80.4	47.8	20.1	192.4	23.1	226.2	5.8	78.2	50.1	18.6	187.1	21.9	222.7	5.6		
48	85.5	45.7	22.3	204.6	26.0	236.7	6.4	83.4	48.0	20.7	199.6	24.8	233.5	6.2	81.2	50.4	19.2	194.3	23.5	230.0	6.0		

	Entering Condenser Water Temperature																						
	80							85							90								
Evap				Evap		Cond					Evap		Cond					Evap		Cond			
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP		
40	67.9	51.6	15.7	162.3	16.6	199.2	4.5	65.9	54.1	14.6	157.6	15.7	196.3	4.4	63.9	56.8	13.4	152.6	14.7	193.3	4.2		
42	70.5	51.9	16.2	168.6	17.8	205.6	4.8	68.5	54.4	15.0	163.8	16.9	202.7	4.6	66.3	57.1	13.9	158.4	15.8	199.4	4.4		
44	73.2	52.2	16.7	175.0	19.2	212.2	5.1	71.1	54.8	15.5	170.0	18.1	209.2	4.9	68.8	57.5	14.3	164.5	17.0	205.7	4.7		
46	76.0	52.5	17.3	181.8	20.7	219.2	5.4	73.8	55.1	16.0	176.5	19.5	215.9	5.2	71.4	57.8	14.7	170.9	18.3	212.3	5.0		
48	78.8	52.8	17.8	188.8	22.2	226.4	5.7	76.5	55.5	16.5	183.2	21.0	222.8	5.5	74.1	58.2	15.2	177.4	19.7	219.0	5.2		

	Entering Condenser Water Temperature																						
	95							100							105								
Evap				Evap		Cond					Evap		Cond					Evap		Cond			
LWT	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP	Tons	kW	EER	Flow	DP	Flow	DP		
40	61.7	59.7	12.4	147.5	13.8	190.2	4.0	59.5	62.8	11.3	142.2	12.8	187.2	3.9	57.3	66.2	10.3	136.9	11.9	184.2	3.7		
42	64.1	60.0	12.8	153.2	14.8	196.2	4.2	61.8	63.2	11.7	147.7	13.8	193.0	4.1	59.5	66.6	10.7	142.3	12.9	189.9	3.9		
44	66.5	60.4	13.1	159.0	15.9	202.3	4.5	64.2	63.6	12.1	153.6	14.9	199.1	4.3	61.8	67.0	11.0	147.8	13.8	195.7	4.2		
46	69.0	60.8	13.6	165.2	17.2	208.7	4.8	66.7	64.0	12.5	159.7	16.1	205.5	4.6	64.2	67.4	11.4	153.6	14.9	201.7	4.4		
48	71.7	61.2	14.0	171.6	18.5	215.4	5.0	69.2	64.4	12.8	165.7	17.3	211.8	4.8	66.6	67.8	11.7	159.5	16.0	207.9	4.6		

Notes:

1. Rated in accordance with ARI Standard 550/590-2010 with
   - Water-side fouling factor allowance of 0.0001 hr-ft^2-°F/BTU for evaporator and 0.00025 hr-ft^2-°F/BTU for condenser.
   - Test tolerance at full load for capacity, input power and EER = ± 5%.
2. Ratings are based on a 10°F temperature drop in evaporator and a 10°F temperature rise in condenser.
3. Flow = Water-side flowrate in gpm.
4. 100% of the condenser flow will pass through single condensers on NWC15, 20, 26 and 30 models.
5. 50% of the condenser flow will pass through each of two condensers on NWC40, 52, 60 and 70 models.
6. DP = Water-side pressure drop in feet of water.
7. kW = Power input for compressors only.
8. EER = Energy Efficiency Ratio (cooling capacity in BTUH divided by total power input in watts).
9. Interpolation between points is permissible. Extrapolation is not permitted.
10. Consult NAPPS for performance at special conditions.

Table 22-1 Performance Data - NCC15 Compressor Chiller

	Saturated Discharge Temperature													
	100							110						
Evap				Evaporator		Total Heat Rejection					Evaporator		Total Heat Rejection	
LWT	Tons	kW	EER	Flow	DP	Per Circuit	Total	Tons	kW	EER	Flow	DP	Per Circuit	Total
40	14.4	11.9	14.2	34.5	8.9	213,929	213,929	13.6	13.4	11.9	32.4	8.0	208,203	208,203
42	15.0	12.0	14.7	35.8	9.5	220,480	220,480	14.1	13.4	12.4	33.6	8.5	214,345	214,345
44	15.5	12.0	15.2	37.2	10.2	227,303	227,303	14.6	13.4	12.8	34.9	9.1	220,999	220,999
46	16.1	12.0	15.8	38.6	10.9	234,510	234,510	15.2	13.4	13.3	36.3	9.8	227,692	227,692
48	16.7	12.0	16.4	40.1	11.7	241,833	241,833	15.7	13.4	13.8	37.7	10.4	234,629	234,629

	Saturated Discharge Temperature													
	120							130						
Evap				Evaporator		Total Heat Rejection					Evaporator		Total Heat Rejection	
LWT	Tons	kW	EER	Flow	DP	Per Circuit	Total	Tons	kW	EER	Flow	DP	Per Circuit	Total
40	12.6	15.0	9.9	30.2	7.1	202,822	202,822	11.7	16.8	8.2	27.9	6.1	197,336	197,336
42	13.1	15.0	10.3	31.4	7.6	208,598	208,598	12.1	16.8	8.5	29.0	6.6	202,734	202,734
44	13.6	15.0	10.7	32.6	8.1	214,580	214,580	12.6	16.8	8.8	30.1	7.0	208,348	208,348
46	14.1	15.0	11.1	33.8	8.6	220,864	220,864	13.1	16.8	9.2	31.2	7.5	214,122	214,122
48	14.7	15.0	11.5	35.2	9.2	227,547	227,547	13.6	16.8	9.5	32.5	8.0	220,118	220,118

Table 22-2 Performance Data - NCC20 Compressor Chiller

	Saturated Discharge Temperature													
	100							110						
Evap				Evaporator		Total Heat Rejection					Evaporator		Total Heat Rejection	
LWT	Tons	kW	EER	Flow	DP	Per Circuit	Total	Tons	kW	EER	Flow	DP	Per Circuit	Total
40	19.9	15.5	15.2	47.6	10.4	291,681	291,681	18.6	17.4	12.7	44.5	9.2	282,858	282,858
42	20.6	15.5	15.7	49.3	11.2	300,507	300,507	19.4	17.4	13.2	46.3	9.9	291,513	291,513
44	21.4	15.5	16.2	51.1	12.0	309,552	309,552	20.1	17.4	13.6	48.0	10.6	300,322	300,322
46	22.2	15.5	16.8	53.0	12.8	318,948	318,948	20.8	17.4	14.1	49.9	11.4	309,530	309,530
48	23.0	15.6	17.4	54.9	13.7	328,497	328,497	21.6	17.4	14.7	51.8	12.2	318,835	318,835

	Saturated Discharge Temperature													
	120							130						
Evap				Evaporator		Total Heat Rejection					Evaporator		Total Heat Rejection	
LWT	Tons	kW	EER	Flow	DP	Per Circuit	Total	Tons	kW	EER	Flow	DP	Per Circuit	Total
40	17.2	19.7	10.3	41.1	8.0	273,661	273,661	15.7	22.4	8.3	37.4	6.7	264,355	264,355
42	17.9	19.7	10.8	42.8	8.6	282,021	282,021	16.3	22.4	8.6	39.0	7.2	272,088	272,088
44	18.6	19.7	11.2	44.5	9.2	290,354	290,354	17.0	22.4	9.0	40.6	7.8	280,103	280,103
46	19.4	19.7	11.6	46.3	9.9	299,475	299,475	17.7	22.4	9.4	42.3	8.4	288,538	288,538
48	20.1	19.7	12.1	48.1	10.7	308,469	308,469	18.4	22.3	9.8	44.0	9.1	297,016	297,016

Notes:

1. Rated in accordance with ARI Standard 550/590-2010 with
   - Water-side fouling factor allowance of 0.0001 hr-ft^2-°F/BTU for evaporator.
   - Test tolerance at full load for capacity, input power and EER = ± 5%.
2. Ratings are based on a 10°F temperature drop in evaporator and a refrigerant liquid subcooling (SC) of 5°F.
3. Refrigerant saturated discharge temperature (SDT) and SC measured at NAPPS unit.
4. Flow = Water-side flowrate in gpm.
5. NCC15, 20, 26 and 30 models have a single refrigerant circuit. NCC40, 52, 60 and 70 models have two refrigerant circuits.
6. DP = Water-side pressure drop in feet of water.
7. kW = Power input for compressors only.
8. EER = Energy Efficiency Ratio (cooling capacity in BTUH divided by total power input in watts).
9. Total Heat Rejection is stated in BTUH.
10. Interpolation between points is permissible. Extrapolation is not permitted.
11. Consult NAPPS for performance at special conditions.

FULL LOAD PERFORMANCE DATA

Table 23-1 Performance Data - NCC26 Compressor Chiller

	Saturated Discharge Temperature													
	100							110						
Evap				Evaporator		Total Heat Rejection					Evaporator		Total Heat Rejection	
LWT	Tons	kW	EER	Flow	DP	Per Circuit	Total	Tons	kW	EER	Flow	DP	Per Circuit	Total
40	24.7	20.0	14.6	58.9	11.0	364,222	364,222	23.2	22.3	12.3	55.4	9.8	354,200	354,200
42	25.6	20.1	15.1	61.2	11.8	375,489	375,489	24.1	22.3	12.8	57.5	10.5	365,085	365,085
44	26.5	20.1	15.6	63.5	12.7	387,219	387,219	25.0	22.4	13.2	59.7	11.3	376,038	376,038
46	27.5	20.2	16.1	65.9	13.6	399,333	399,333	25.9	22.5	13.7	62.0	12.1	387,551	387,551
48	28.6	20.3	16.7	68.3	14.6	411,815	411,815	26.9	22.5	14.1	64.3	13.0	399,276	399,276

	Saturated Discharge Temperature													
	120							130						
Evap				Evaporator		Total Heat Rejection					Evaporator		Total Heat Rejection	
LWT	Tons	kW	EER	Flow	DP	Per Circuit	Total	Tons	kW	EER	Flow	DP	Per Circuit	Total
40	21.6	24.9	10.3	51.6	8.6	344,228	344,228	19.8	27.9	8.4	47.4	7.3	333,270	333,270
42	22.4	25.0	10.7	53.6	9.2	354,133	354,133	20.6	28.0	8.8	49.2	7.9	342,618	342,618
44	23.3	25.0	11.0	55.6	9.9	364,434	364,434	21.4	28.0	9.1	51.2	8.4	352,326	352,326
46	24.1	25.1	11.4	57.7	10.6	375,105	375,105	22.2	28.1	9.4	53.1	9.1	362,271	362,271
48	25.1	25.1	11.8	60.0	11.4	386,406	386,406	23.0	28.1	9.7	55.2	9.7	372,428	372,428

Table 23-2 Performance Data - NCC30 Compressor Chiller

	Saturated Discharge Temperature													
	100							110						
Evap				Evaporator		Total Heat Rejection					Evaporator		Total Heat Rejection	
LWT	Tons	kW	EER	Flow	DP	Per Circuit	Total	Tons	kW	EER	Flow	DP	Per Circuit	Total
40	28.8	23.4	14.6	68.9	9.2	425,886	425,886	27.2	26.0	12.4	64.9	8.2	414,590	414,590
42	29.9	23.5	15.1	71.5	9.8	439,026	439,026	28.2	26.1	12.8	67.4	8.8	427,102	427,102
44	31.0	23.6	15.5	74.1	10.5	452,563	452,563	29.2	26.1	13.3	69.9	9.4	440,092	440,092
46	32.1	23.8	16.0	76.9	11.2	466,623	466,623	30.3	26.3	13.7	72.6	10.1	453,503	453,503
48	33.3	23.9	16.5	79.7	12.0	481,062	481,062	31.4	26.4	14.2	75.3	10.8	467,328	467,328

	Saturated Discharge Temperature													
	120							130						
Evap				Evaporator		Total Heat Rejection					Evaporator		Total Heat Rejection	
LWT	Tons	kW	EER	Flow	DP	Per Circuit	Total	Tons	kW	EER	Flow	DP	Per Circuit	Total
40	25.3	28.9	10.4	60.5	7.2	402,428	402,428	23.2	32.4	8.5	55.4	6.2	388,881	388,881
42	26.3	29.0	10.8	62.8	7.8	414,243	414,243	24.1	32.4	8.9	57.7	6.6	400,139	400,139
44	27.3	29.1	11.1	65.2	8.3	426,490	426,490	25.1	32.5	9.2	60.0	7.1	411,750	411,750
46	28.3	29.2	11.5	67.7	8.9	439,297	439,297	26.0	32.6	9.5	62.3	7.6	423,653	423,653
48	29.4	29.3	11.9	70.3	9.5	452,351	452,351	27.0	32.6	9.9	64.7	8.2	435,806	435,806

Notes:

1. Rated in accordance with ARI Standard 550/590-2010 with
   - Water-side fouling factor allowance of 0.0001 hr-ft^2-°F/BTU for evaporator.
   - Test tolerance at full load for capacity, input power and EER = ± 5%.
2. Ratings are based on a 10°F temperature drop in evaporator and a refrigerant liquid subcooling (SC) of 5°F.
3. Refrigerant saturated discharge temperature (SDT) and SC measured at NAPPS unit.
4. Flow = Water-side flowrate in gpm.
5. NCC15, 20, 26 and 30 models have a single refrigerant circuit. NCC40, 52, 60 and 70 models have two refrigerant circuits.
6. DP = Water-side pressure drop in feet of water.
7. kW = Power input for compressors only.
8. EER = Energy Efficiency Ratio (cooling capacity in BTUH divided by total power input in watts).
9. Total Heat Rejection is stated in BTUH.
10. Interpolation between points is permissible. Extrapolation is not permitted.
11. Consult NAPPS for performance at special conditions.

Table 24-1 Performance Data - NCC40 Compressor Chiller

	Saturated Discharge Temperature													
	100							110						
Evap				Evaporator		Total Heat Rejection					Evaporator		Total Heat Rejection	
LWT	Tons	kW	EER	Flow	DP	Per Circuit	Total	Tons	kW	EER	Flow	DP	Per Circuit	Total
40	39.9	30.9	15.3	95.3	7.7	292,046	584,091	37.4	34.7	12.8	89.3	6.9	283,439	566,878
42	41.4	31.0	15.9	99.0	8.3	301,354	602,707	38.8	34.7	13.3	92.8	7.4	292,201	584,403
44	43.0	31.0	16.5	102.8	8.9	310,764	621,529	40.4	34.8	13.8	96.5	7.9	301,521	603,042
46	44.6	31.1	17.1	106.7	9.5	320,553	641,106	42.0	34.8	14.4	100.4	8.5	311,103	622,207
48	46.2	31.1	17.7	110.7	10.1	330,595	661,190	43.6	34.8	14.9	104.3	9.1	320,844	641,689

	Saturated Discharge Temperature													
	120							130						
Evap				Evaporator		Total Heat Rejection					Evaporator		Total Heat Rejection	
LWT	Tons	kW	EER	Flow	DP	Per Circuit	Total	Tons	kW	EER	Flow	DP	Per Circuit	Total
40	34.6	39.3	10.5	82.6	6.0	274,604	549,208	31.5	44.8	8.4	75.2	5.1	265,395	530,790
42	36.0	39.3	10.9	86.0	6.5	282,947	565,894	32.8	44.8	8.7	78.3	5.5	273,038	546,075
44	37.4	39.3	11.3	89.5	6.9	291,599	583,198	34.1	44.7	9.1	81.7	5.9	281,230	562,461
46	38.9	39.3	11.8	93.1	7.4	300,702	601,405	35.6	44.7	9.5	85.1	6.3	289,648	579,297
48	40.5	39.3	12.3	96.9	8.0	310,089	620,178	37.0	44.7	9.9	88.6	6.8	298,363	596,726

Table 24-2 Performance Data - NCC52 Compressor Chiller

	Saturated Discharge Temperature													
	100							110						
Evap				Evaporator		Total Heat Rejection					Evaporator		Total Heat Rejection	
LWT	Tons	kW	EER	Flow	DP	Per Circuit	Total	Tons	kW	EER	Flow	DP	Per Circuit	Total
40	49.3	39.9	14.7	117.7	8.9	363,831	727,661	46.4	44.6	12.4	110.9	8.0	354,520	709,039
42	51.1	40.1	15.2	122.3	9.5	375,297	750,593	48.2	44.7	12.9	115.1	8.5	365,189	730,377
44	53.1	40.2	15.7	127.0	10.2	387,336	774,672	50.0	44.8	13.3	119.6	9.1	376,445	752,890
46	55.2	40.4	16.3	132.1	11.0	400,309	800,618	51.9	44.9	13.8	124.3	9.8	388,278	776,556
48	57.4	40.6	16.9	137.3	11.8	413,365	826,730	53.9	45.1	14.3	129.1	10.5	400,593	801,187

	Saturated Discharge Temperature													
	120							130						
Evap				Evaporator		Total Heat Rejection					Evaporator		Total Heat Rejection	
LWT	Tons	kW	EER	Flow	DP	Per Circuit	Total	Tons	kW	EER	Flow	DP	Per Circuit	Total
40	43.3	49.8	10.4	103.5	7.0	345,012	690,023	39.8	55.8	8.5	95.2	6.1	334,170	668,340
42	45.0	49.9	10.7	107.5	7.5	354,920	709,840	41.4	55.9	8.8	98.9	6.5	343,547	687,093
44	46.7	50.0	11.1	111.6	8.1	365,372	730,744	43.0	56.0	9.2	102.7	6.9	353,353	706,706
46	48.5	50.1	11.5	115.9	8.6	376,327	752,654	44.6	56.1	9.5	106.8	7.4	363,485	726,969
48	50.3	50.3	11.9	120.4	9.3	387,674	775,349	46.3	56.2	9.8	110.8	7.9	373,549	747,097

Notes:

1. Rated in accordance with ARI Standard 550/590-2010 with
   - Water-side fouling factor allowance of 0.0001 hr-ft^2-°F/BTU for evaporator.
   - Test tolerance at full load for capacity, input power and EER = ± 5%.
2. Ratings are based on a 10°F temperature drop in evaporator and a refrigerant liquid subcooling (SC) of 5°F.
3. Refrigerant saturated discharge temperature (SDT) and SC measured at NAPPS unit.
4. Flow = Water-side flowrate in gpm.
5. NCC15, 20, 26 and 30 models have a single refrigerant circuit. NCC40, 52, 60 and 70 models have two refrigerant circuits.
6. DP = Water-side pressure drop in feet of water.
7. kW = Power input for compressors only.
8. EER = Energy Efficiency Ratio (cooling capacity in BTUH divided by total power input in watts).
9. Total Heat Rejection is stated in BTUH.
10. Interpolation between points is permissible. Extrapolation is not permitted.
11. Consult NAPPS for performance at special conditions.

FULL LOAD PERFORMANCE DATA

Table 25-1 Performance Data - NCC60 Compressor Chiller

	Saturated Discharge Temperature													
	100							110						
Evap				Evaporator		Total Heat Rejection					Evaporator		Total Heat Rejection	
LWT	Tons	kW	EER	Flow	DP	Per Circuit	Total	Tons	kW	EER	Flow	DP	Per Circuit	Total
40	57.7	46.8	14.7	137.8	10.9	425,938	851,877	54.4	51.9	12.5	129.9	9.7	414,801	829,603
42	59.8	47.0	15.2	143.0	11.7	439,217	878,433	56.4	52.1	12.9	134.8	10.5	427,357	854,715
44	62.1	47.3	15.7	148.4	12.6	453,046	906,092	58.6	52.3	13.4	140.2	11.3	440,988	881,975
46	64.5	47.5	16.2	154.3	13.6	467,955	935,910	60.8	52.5	13.8	145.6	12.1	454,636	909,271
48	66.9	47.8	16.7	160.1	14.6	482,885	965,771	63.2	52.7	14.3	151.2	13.1	468,999	937,998

	Saturated Discharge Temperature													
	120							130						
Evap				Evaporator		Total Heat Rejection					Evaporator		Total Heat Rejection	
LWT	Tons	kW	EER	Flow	DP	Per Circuit	Total	Tons	kW	EER	Flow	DP	Per Circuit	Total
40	50.8	57.9	10.5	121.3	8.5	403,270	806,539	46.6	64.7	8.6	111.3	7.2	389,894	779,788
42	52.6	58.0	10.8	125.8	9.1	414,855	829,711	48.4	64.8	8.9	115.7	7.8	401,064	802,129
44	54.7	58.2	11.2	130.7	9.8	427,200	854,401	50.3	65.0	9.3	120.3	8.4	412,663	825,327
46	56.8	58.3	11.6	135.8	10.6	440,158	880,315	52.3	65.1	9.6	125.0	9.0	424,710	849,421
48	58.9	58.5	12.0	141.1	11.4	453,555	907,109	54.3	65.3	9.9	129.9	9.7	436,993	873,987

Table 25-2 Performance Data - NCC70 Compressor Chiller

	Saturated Discharge Temperature													
	100							110						
Evap				Evaporator		Total Heat Rejection					Evaporator		Total Heat Rejection	
LWT	Tons	kW	EER	Flow	DP	Per Circuit	Total	Tons	kW	EER	Flow	DP	Per Circuit	Total
40	66.1	53.7	14.7	157.9	15.7	488,006	976,012	61.8	59.4	12.4	147.7	13.8	472,363	944,727
42	68.7	53.9	15.2	164.3	17.0	504,332	1,008,665	64.3	59.6	12.9	153.7	14.9	487,606	975,211
44	71.4	54.2	15.7	170.8	18.3	520,997	1,041,995	66.9	59.9	13.3	159.9	16.1	503,543	1,007,086
46	74.2	54.4	16.3	177.6	19.8	538,311	1,076,622	69.6	60.2	13.8	166.4	17.4	519,999	1,039,998
48	77.2	54.6	16.9	184.7	21.3	556,092	1,112,184	72.3	60.4	14.3	173.1	18.8	536,985	1,073,971

	Saturated Discharge Temperature													
	120							130						
Evap				Evaporator		Total Heat Rejection					Evaporator		Total Heat Rejection	
LWT	Tons	kW	EER	Flow	DP	Per Circuit	Total	Tons	kW	EER	Flow	DP	Per Circuit	Total
40	57.4	66.1	10.4	137.1	11.9	457,001	914,003	52.7	74.0	8.5	125.9	10.1	442,401	884,803
42	59.7	66.3	10.8	142.7	12.9	471,448	942,896	54.9	74.2	8.8	131.1	11.0	455,770	911,541
44	62.1	66.6	11.2	148.6	14.0	486,468	972,936	57.1	74.4	9.2	136.6	11.9	469,819	939,638
46	64.7	66.8	11.6	154.7	15.1	502,031	1,004,063	59.5	74.7	9.5	142.3	12.8	484,269	968,537
48	67.2	67.1	12.0	161.0	16.3	518,005	1,036,010	61.9	74.9	9.9	148.1	13.9	499,071	998,142

Notes:

1. Rated in accordance with ARI Standard 550/590-2010 with
   - Water-side fouling factor allowance of 0.0001 hr-ft^2-°F/BTU for evaporator.
   - Test tolerance at full load for capacity, input power and EER = ± 5%.
2. Ratings are based on a 10°F temperature drop in evaporator and a refrigerant liquid subcooling (SC) of 5°F.
3. Refrigerant saturated discharge temperature (SDT) and SC measured at NAPPS unit.
4. Flow = Water-side flowrate in gpm.
5. NCC15, 20, 26 and 30 models have a single refrigerant circuit. NCC40, 52, 60 and 70 models have two refrigerant circuits.
6. DP = Water-side pressure drop in feet of water.
7. kW = Power input for compressors only.
8. EER = Energy Efficiency Ratio (cooling capacity in BTUH divided by total power input in watts).
9. Total Heat Rejection is stated in BTUH.
10. Interpolation between points is permissible. Extrapolation is not permitted.
11. Consult NAPPS for performance at special conditions.

Chart 26-1 Evaporator Pressure Drops - NWC Water Cooled Chillers & NCC Compressor Chillers

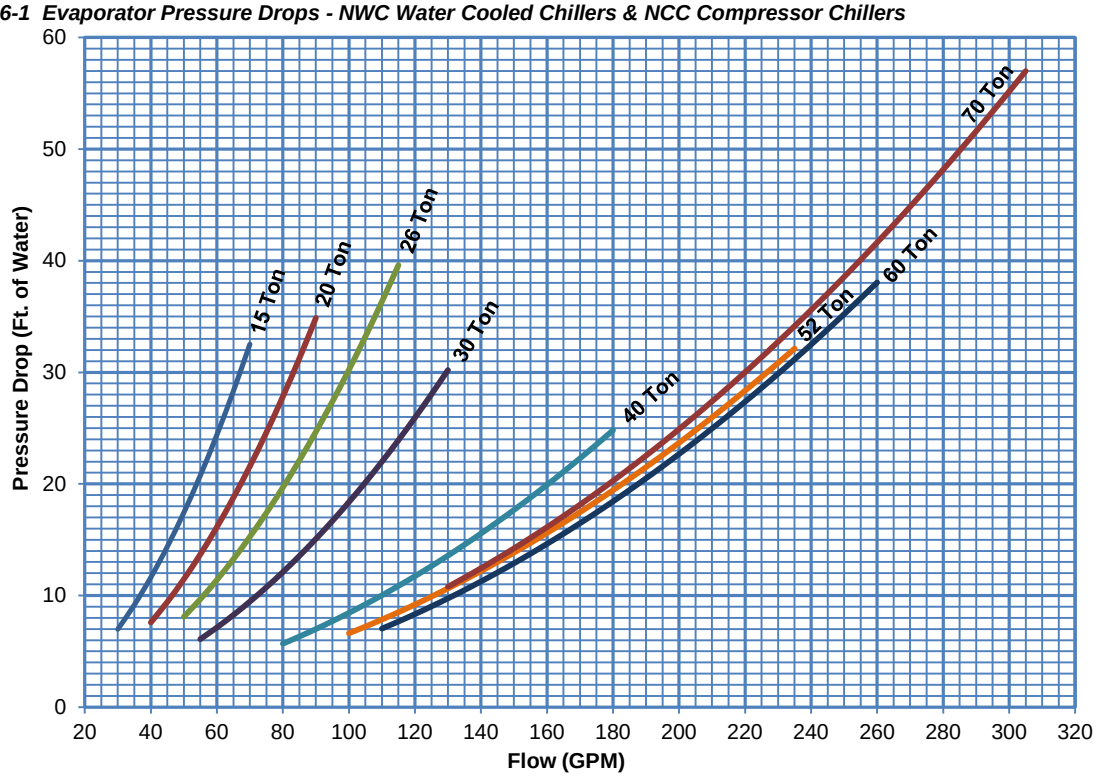
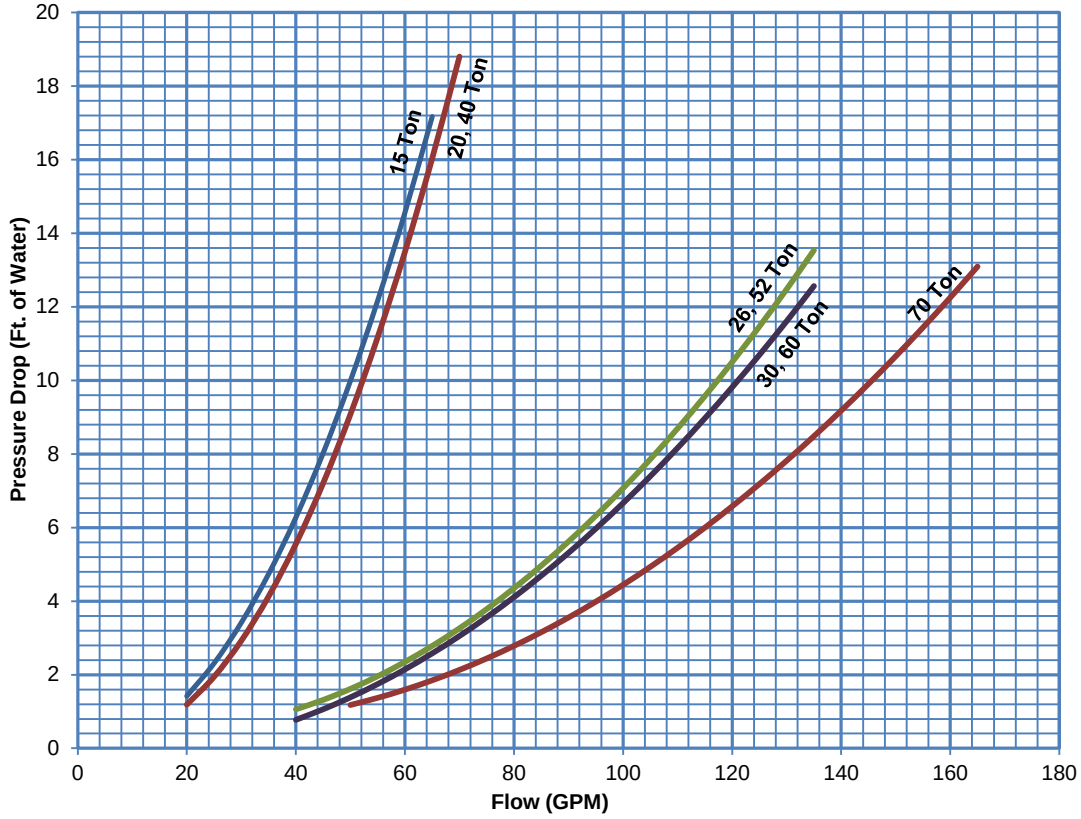


Chart 26-2 Condenser Pressure Drops - NWC Water Cooled Chillers



PRESSURE DROP DATA

Chart 27-1 Water Regulating Valve Pressure Drops - NWC Water Cooled Chillers

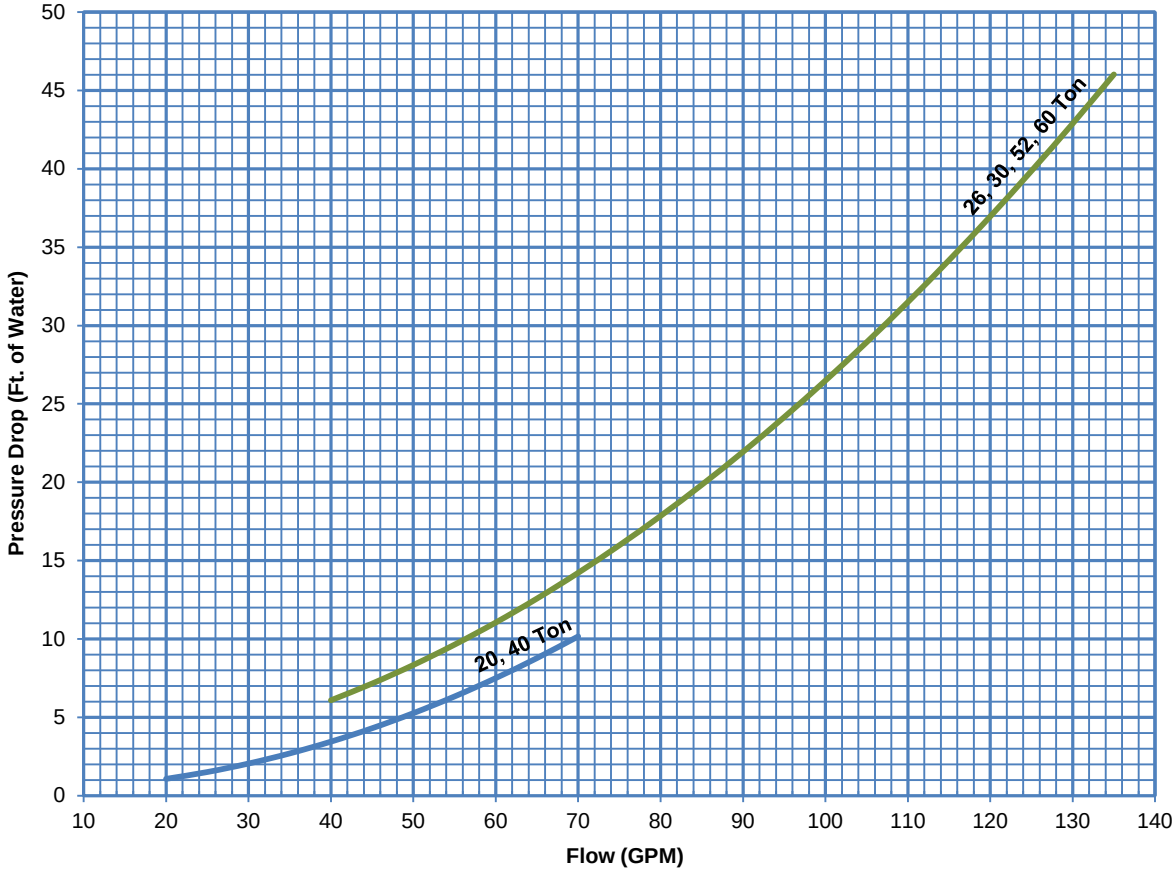


Table 28-1 Electrical Data - NWC Water Cooled Chillers & NCC Compressor Chillers

Unit Size	Unit Wiring Data: Rated Voltage	Minimum Circuit Ampacity	Maximum Fuse Size	Recommended Dual Element Fuse Size	Compressor: Qty	# Refrig. Circuits	Nom. Tons	RLA, each	LRA, each	Control kW
15	200-230/3/60	67	90	80	2	1	7.5/7.5	29	195	0.16
	200-220/3/50	67	90	80				29	203	0.16
	460/3/60	34	45	40				15	95	0.16
	380-420/3/50	34	45	40				15	95	0.16
	380/3/60	38	50	45				17	123	0.16
	575/3/60	28	35	30				12	80	0.16
20	200-230/3/60	75	100	90	2	1	10/10	33	239	0.16
	200-220/3/50	79	110	90				35	239	0.16
	460/3/60	41	50	45				18	125	0.16
	380-420/3/50	41	50	45				18	118	0.16
	380/3/60	54	70	60				24	145	0.16
	575/3/60	29	40	35				13	80	0.16
26	200-230/3/60	116	150	125	2	1	13/13	51	300	0.16
	200-220/3/50	106	150	125				47	295	0.16
	460/3/60	52	70	60				23	150	0.16
	380-420/3/50	50	70	60				22	140	0.16
	380/3/60	61	80	70				27	139	0.16
	575/3/60	45	60	50				20	109	0.16
30	200-230/3/60	126	175	150	2	1	15/15	56	340	0.16
	200-220/3/50	115	150	125				51	325	0.16
	460/3/60	61	80	70				27	173	0.16
	380-420/3/50	57	80	60				25	173	0.16
	380/3/60	77	110	90				34	196	0.16
	575/3/60	54	70	60				24	132	0.16
40	200-230/3/60	142	150	150	4	2	10/10, 10/10	33	239	0.24
	200-220/50	149	175	150				35	239	0.24
	460/3/60	77	90	80				18	125	0.24
	380-420/3/50	77	90	80				18	118	0.24
	380/3/60	102	110	110				24	145	0.24
	575/3/60	55	60	60				13	80	0.24
52	200-230/3/60	218	250	225	4	2	13/13, 13/13	51	300	0.24
	200-220/3/50	200	225	200				47	295	0.24
	460/3/60	99	110	100				23	150	0.24
	380-420/3/50	94	110	100				22	140	0.24
	380/3/60	115	125	125				27	139	0.24
	575/3/60	85	100	90				20	109	0.24
60	200-230/3/60	238	250	250	4	2	15/15, 15/15	56	340	0.24
	200-220/3/50	217	250	225				51	325	0.24
	460/3/60	115	125	125				27	173	0.24
	380-420/3/50	107	125	110				25	173	0.24
	380/3/60	145	175	150				34	196	0.24
	575/3/60	102	110	110				24	132	0.24
70	208-230/3/60	279	350	300	4	2	15/20, 15/20	56/74	340/505	0.24
	200/3/50	269	300	300				51/74	325/480	0.24
	460/3/60	123	150	125				27/30	173/225	0.24
	380-420/3/50	119	125	125				25/30	173/225	0.24
	380/3/60	154	175	150				34/38	196/290	0.24
	575/3/60	104	125	110				24/25	132/180	0.24

Notes:

1. Use copper conductors only.
2. Local codes may take precedence.
3. Voltage Utilization Range:

Rated Voltage	Utilization Range
200-230/3/60	180-253
208-230/3/60	187-253
460/3/60	414-506
380/3/60	342-418
575/3/60	518-632
200/3/50	180-220
200-220/3/50	180-242
380-420/50	342-462

WEIGHT DATA

Table 29-1 Weights - NWC Water Cooled Chillers

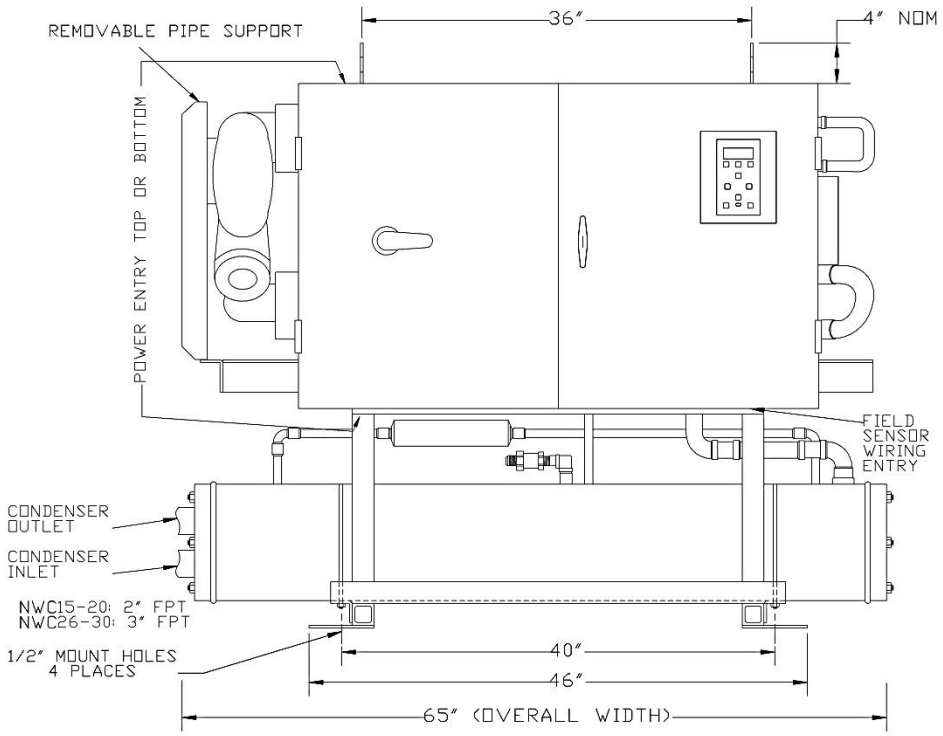
Unit		15	20	26	30	40	52	60	70
Operating Weight	(pounds)	1,145	1,200	1,330	1,400	2,100	2,300	2,655	2,972
Shipping Weight	(pounds)	1,260	1,310	1,430	1,490	2,170	2,350	2,690	2,990

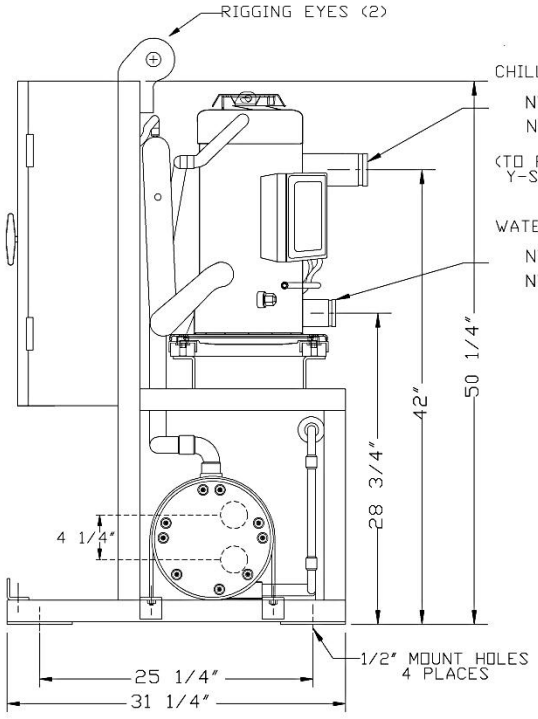
Table 29-2 Weights - NCC Compressor Chillers

Unit		15	20	26	30	40	52	60	70
Operating Weight	(pounds)	825	875	1,145	1,285	1,390	1,460	1,745	2,035
Shipping Weight	(pounds)	965	1,010	1,275	1,410	1,510	1,570	1,850	2,125

DIMENSIONAL DATA

NWC 15-30 TON





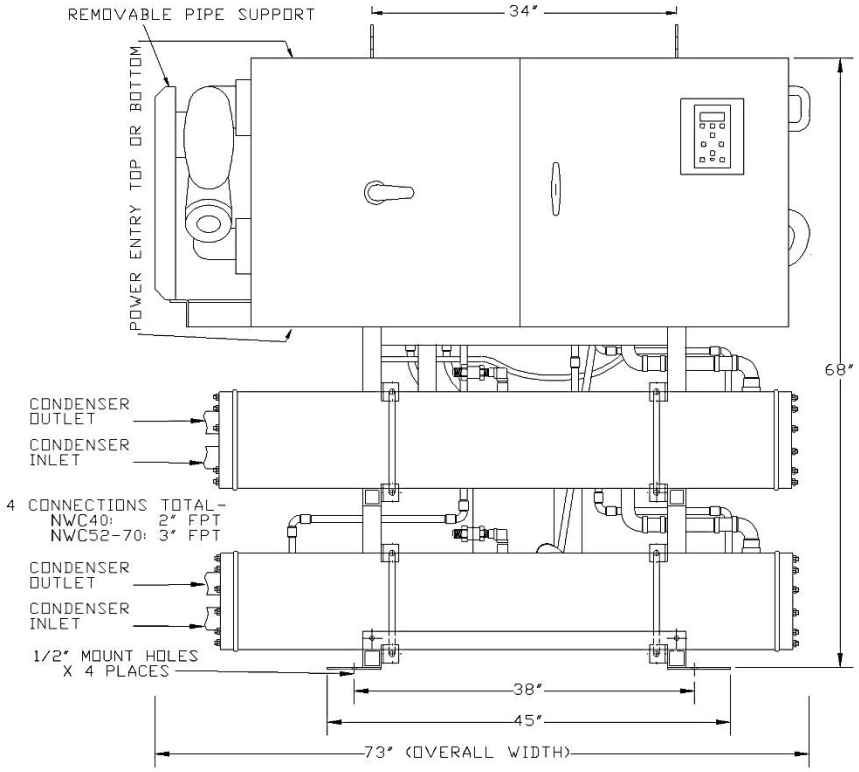
MODEL	OPERATING WEIGHT	SHIPPING WEIGHT
NWC-15	1145 LBS	1260 LBS
NWC-20	1200 LBS	1310 LBS
NWC-26	1330 LBS	1430 LBS
NWC-30	1400 LBS	1490 LBS

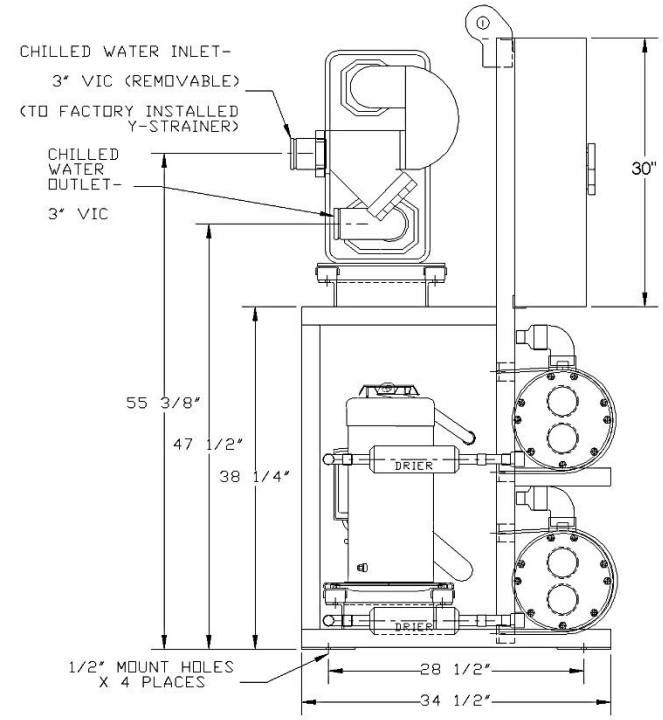
NOTES:

1. 3/4″ FLARE DISCHARGE, 600# RELIEF ON CONDENSER VESSEL
2. ALLOW 60″ CLEARANCE AT ENDS FOR SERVICE OF CONDENSERS.
3. ALLOW 36″ CLEARANCE ON CONTROLBOX SIDE FOR SERVICE.
4. ALLOW 24″ MIN AT REAR TO ALLOW FOR SERVICE OF COMPRESSORS.
5. ADD 12″ NOM TO UNIT LENGTH IF EQUIPPED WITH FACTORY INST'D WRV
6. ALLOW 36″ SERVICE CLEARANCE OVERHEAD.

DIMENSIONAL DATA

NWC 40-70 TON



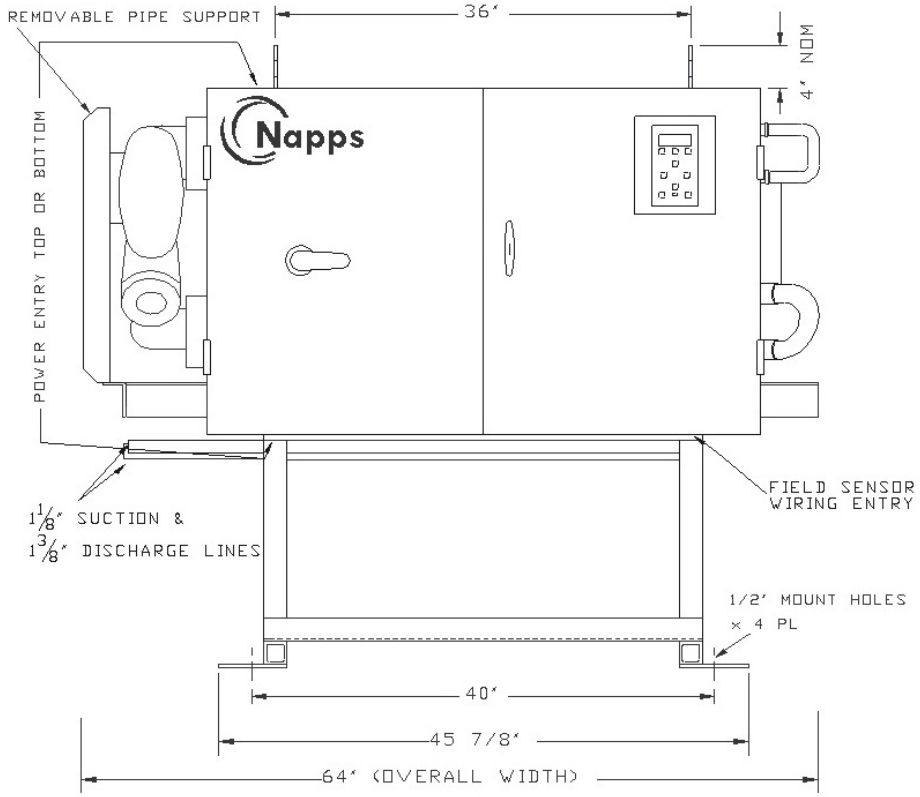


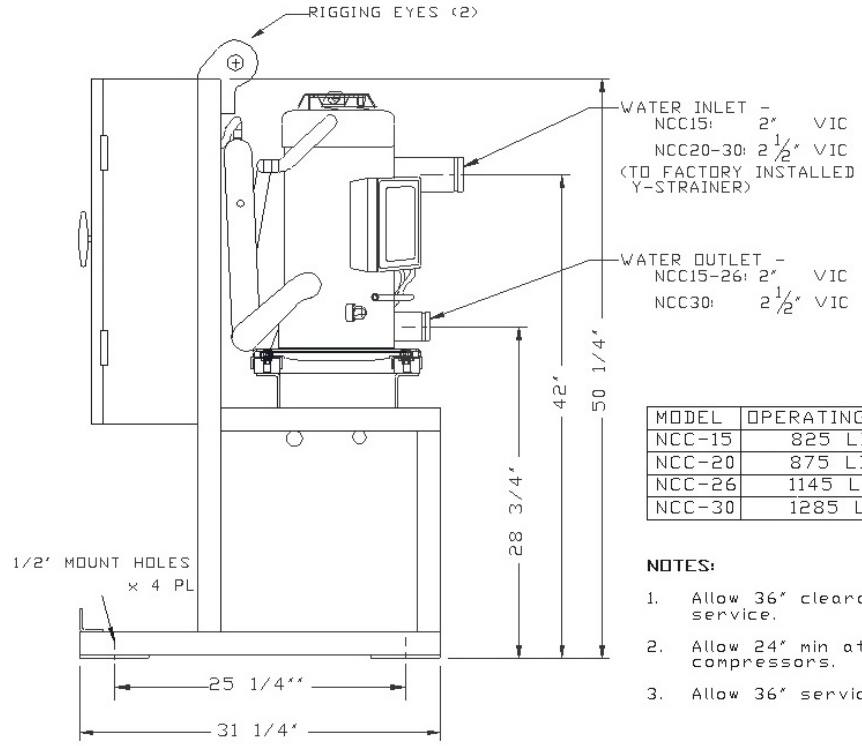
MODEL	OPERATING WEIGHT	SHIPPING WEIGHT
NWC-40	2100 LBS	2170 LBS
NWC-52	2300 LBS	2350 LBS
NWC-60	2655 LBS	2690 LBS
NWC-70	2972 LBS	2990 LBS

NOTES:

1. 3/4" FLARE DISCHARGE, 600# RELIEF ON CONDENSER VESSEL
2. ALLOW 60" CLEARANCE AT ENDS FOR SERVICE OF CONDENSERS.
3. ALLOW 36" CLEARANCE ON CONTROLBOX SIDE FOR SERVICE.
4. ALLOW 24" MIN AT REAR TO ALLOW FOR SERVICE OF COMPRESSORS.
5. ADD 12" NOM TO UNIT LENGTH IF EQUIPPED WITH FACTORY INST'D WRV SET.
6. ALLOW 36" SERVICE CLEARANCE OVERHEAD.

NCC 15-30 TON





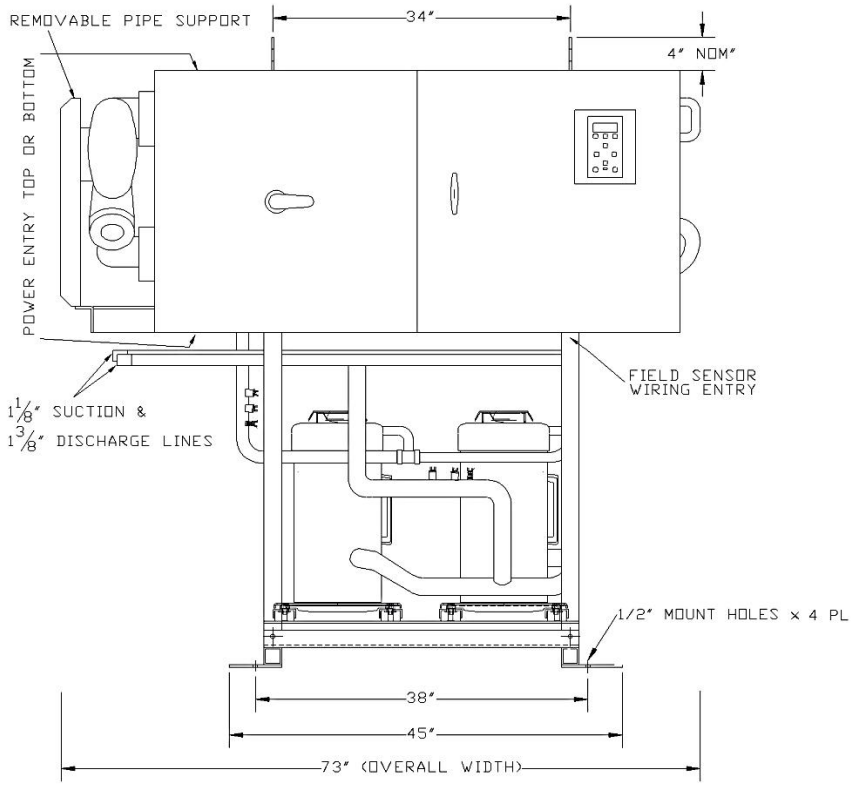
MODEL	OPERATING WEIGHT	SHIPPING WEIGHT
NCC-15	825 LBS	965 LBS
NCC-20	875 LBS	1010 LBS
NCC-26	1145 LBS	1275 LBS
NCC-30	1285 LBS	1410 LBS

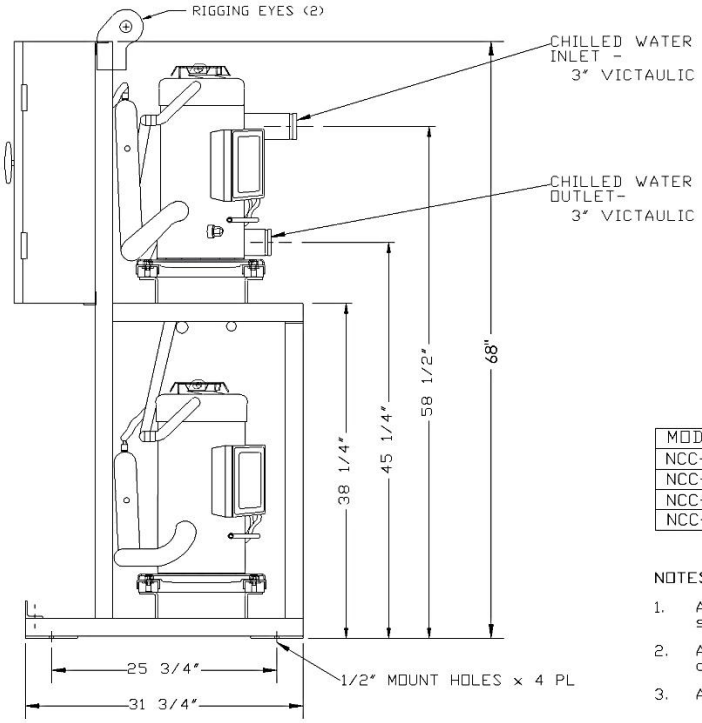
NOTES:

1. Allow 36" clearance on control box side for service.
2. Allow 24" min at rear to allow for service of compressors.
3. Allow 36" service clearance overhead.

DIMENSIONAL DATA

NCC 40-70 TON





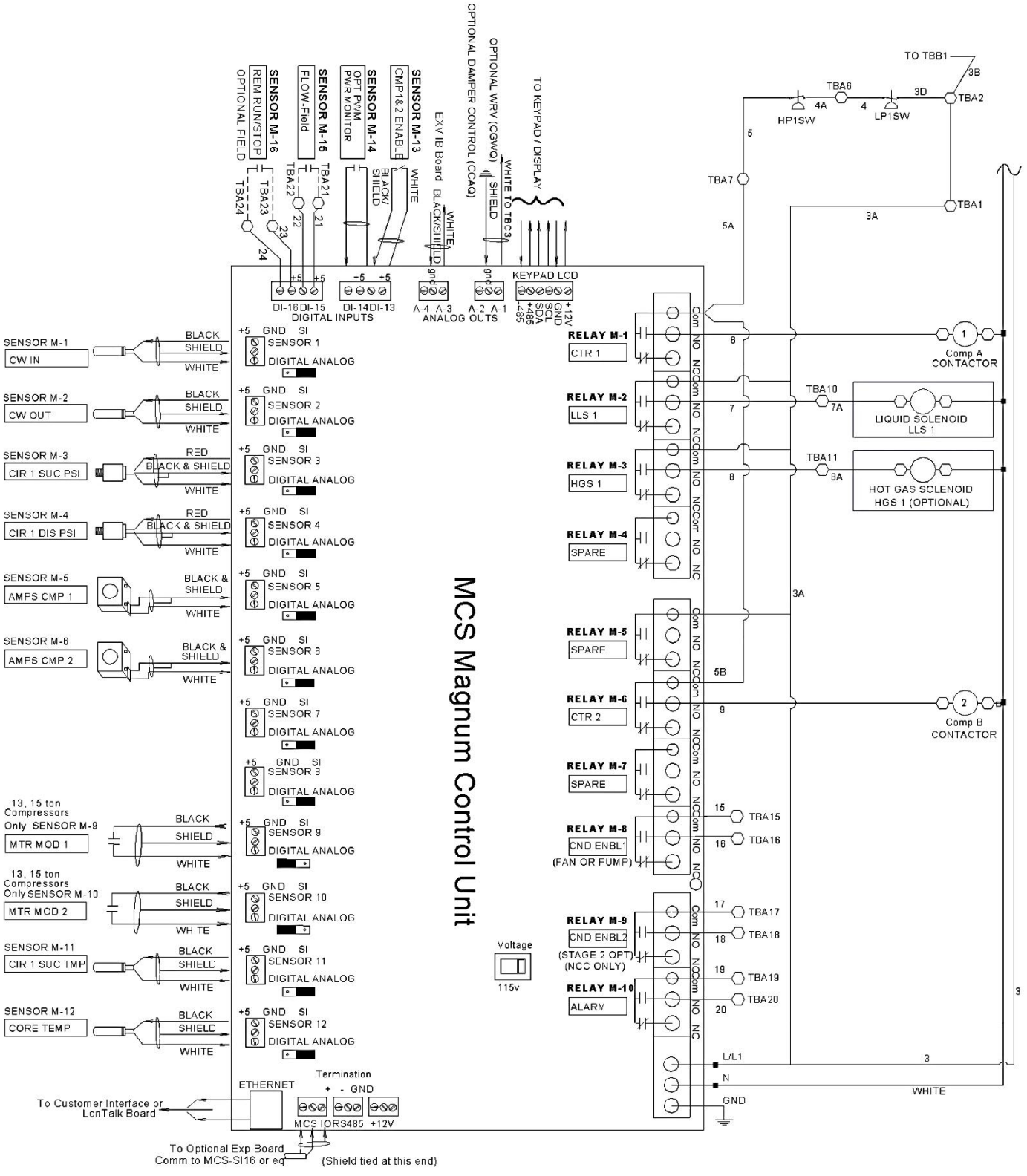
MODEL	OPERATING WEIGHT	SHIPPING WEIGHT
NCC-40	1390 LBS	1510 LBS
NCC-52	1460 LBS	1570 LBS
NCC-60	1745 LBS	1850 LBS
NCC-70	2035 LBS	2125 LBS

NOTES:

1. Allow 36" clearance on control box side for service.
2. Allow 24" min at rear to allow for service of compressors.
3. Allow 36" service clearance overhead.

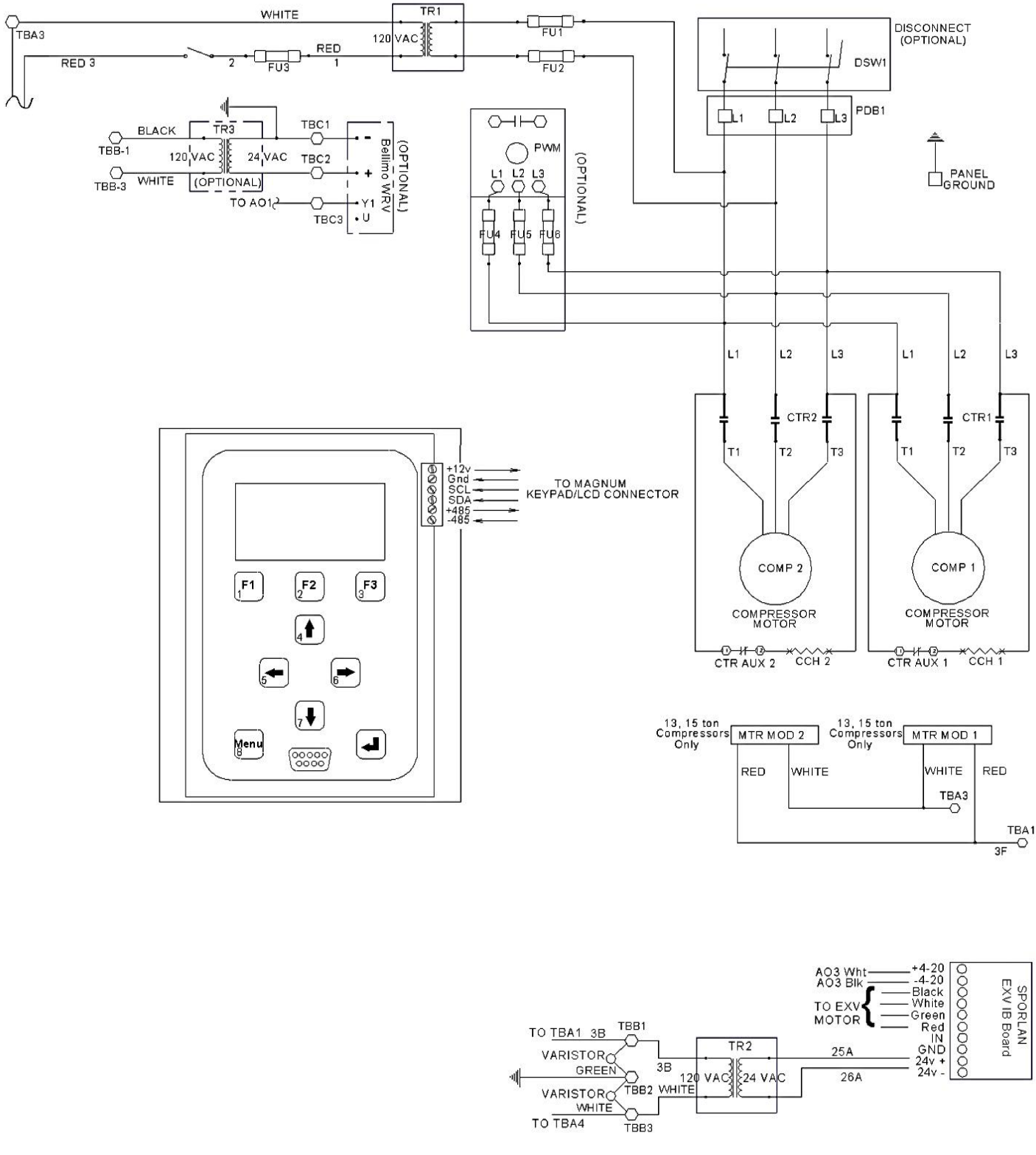
TYPICAL WIRING DIAGRAMS

NWC/NCC 15-30 TON

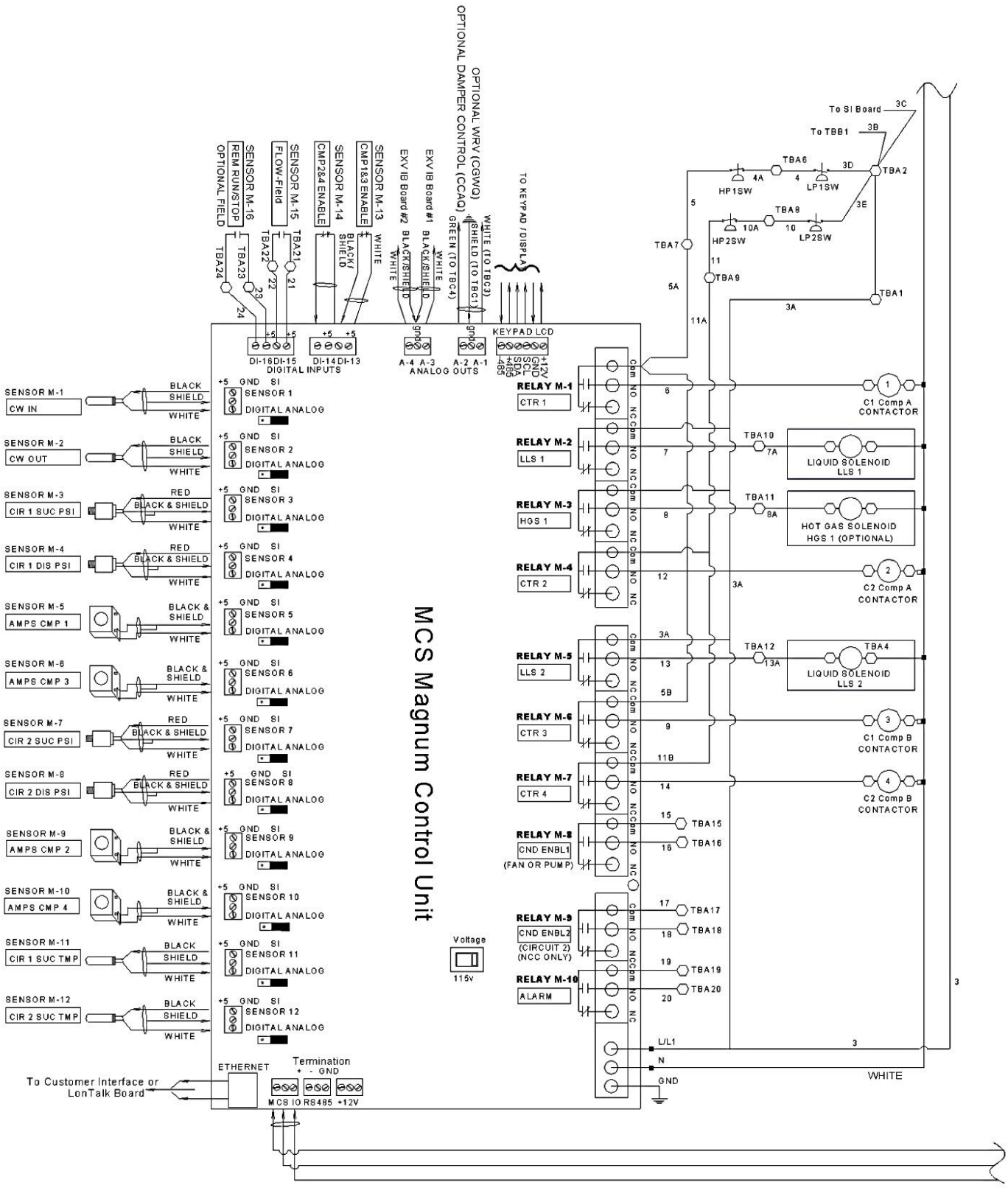


TYPICAL WIRING DIAGRAMS

NWC/NCC 15-30 TON

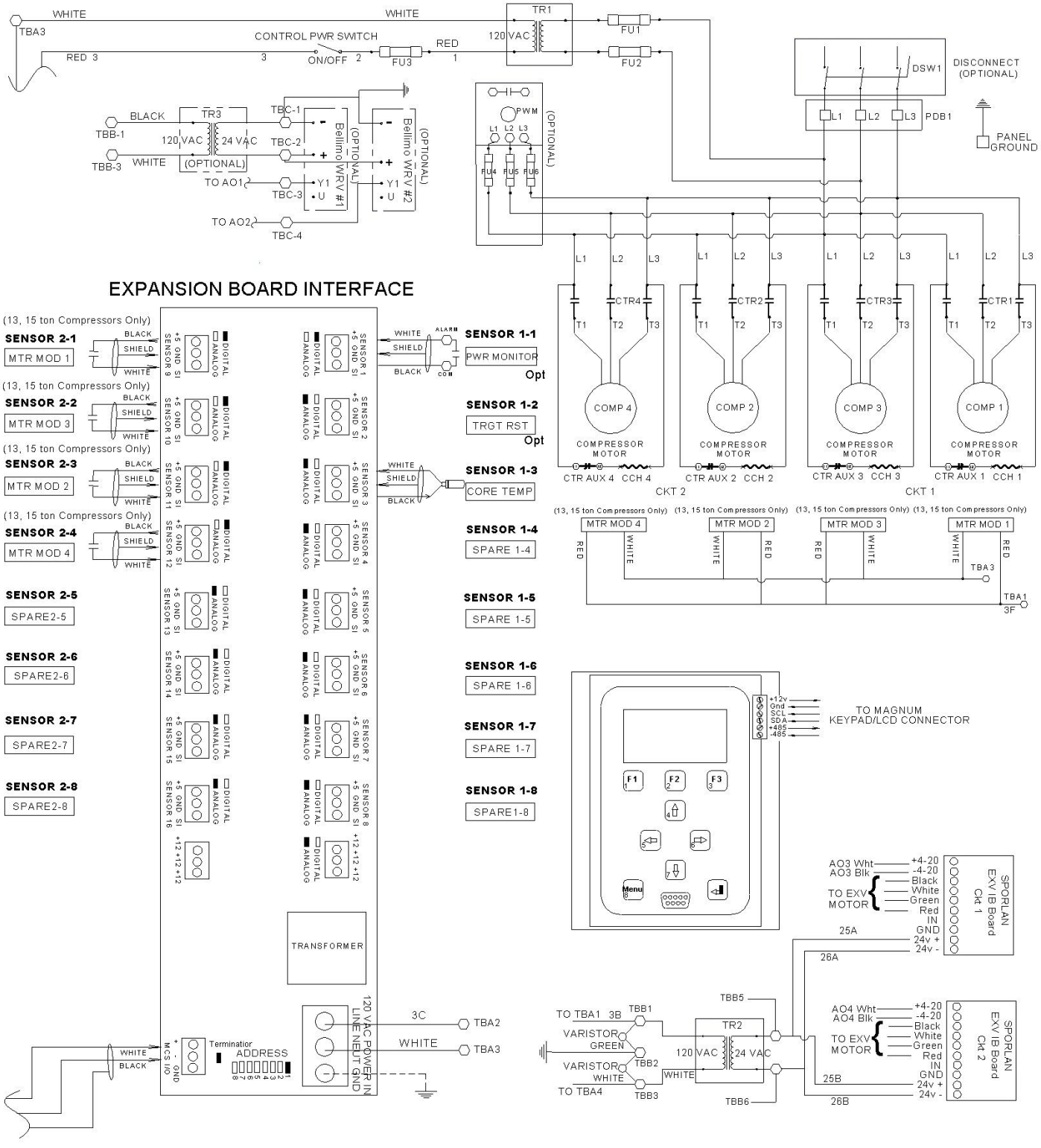


NWC/NCC 40-70 TON



TYPICAL WIRING DIAGRAMS

NWC/NCC 40-70 TON



MECHANICAL SPECIFICATIONS

General
All scroll chillers are factory tested and monitored for power and control operation. NWC units ship with a full operating charge of refrigerant and POE oil. NCC units ship with a full operating charge of POE oil and dry nitrogen. Exposed surfaces are primed and top coated with industrial-quality acrylic enamel.

Compressor-Motor
Direct-drive, hermetic, 3600 rpm, 60 Hz fixed compression, scroll compressors (15 to 30 tons – two compressors; 40 to 70 tons – four compressors). Each compressor has: centrifugal oil pump, oil level sight glass, oil charging valve, two point lubrication for each motor bearing, flooded lubrication for the journal and thrust bearings, and a check valve on the scroll discharge port. Motor is suction gas-cooled, hermetically sealed, two-pole, squirrel cage induction type.

Evaporator
Brazed plate design with seamless copper tubes roller expanded into tube sheets. Designed, tested and stamped in accordance with ASME Code for refrigerant side working pressure of 650 psig. Water side working pressure is 650 psig. Each heat exchanger includes Armaflex (or equal) insulation.

Condenser (NWC Only)
Shell and tube design with internally enhanced copper tubes. Removable, epoxy coated water plates to facilitate cleaning. Epoxy coated tube sheets to prevent pitting caused by galvanic action. Designed, tested and stamped in accordance with ASME. Refrigerant side working pressure is 600 psig. Water side working pressure is 150 psig.

Refrigerant Circuit
NWC refrigeration circuits are completely independent and include filter dryer and combination moisture indicator-sight glass, charging port, insulated suction line, liquid line solenoid valve and electronic expansion valve.

NCC refrigeration circuits are also completely independent and include charging port, insulated suction line, liquid line solenoid valve and electronic expansion valve.

There is one refrigerant circuit on 15 to 30 ton units and two refrigerant circuits on 40 to 70 ton units.

Unit Controls (MCS)
The microprocessor-based control panel is factory-installed and factory-tested. The microprocessor automatically acts to prevent unit shut down due to abnormal operating conditions associated with low evaporator refrigerant temperature, high condensing temperature, and/or motor current overload. If an abnormal operating condition continues and the limit is reached, the machine will shut down.

The panel includes machine protection shutdown requiring manual reset for the following conditions:

- low evaporator refrigerant temp and pressure
- high condenser refrigerant pressure
- critical sensor or detection circuit faults
- motor current overload
- high compressor discharge
- electrical distribution faults: current loss or phase reversal (optional, varies by model)
- external and local emergency stop
- starter contactor interrupt failure. The panel also includes machine protection shutdown with automatic reset for the following correctable conditions:
- power loss
- loss of evaporator water flow

When a fault is detected, the control system conducts more than 60 diagnostic checks and displays results. The display will identify the fault, indicate date, time, and operating mode at time of occurrence, and provide type of reset required and a help message. The diagnostic history will display the last ten diagnostics with their times and dates of occurrence.

Control Panel
The unit control panel contains both a control section and a starter section and is arranged in a key lockable NEMA 1-style enclosure. The starter section contains: top access for power wiring, single point power hook-up, three-phase solid-state overload protection, customer wired grounding lug, and control power transformer with fused protection.

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For more information, contact your local Trane sales Office or e-mail us at pmkrug@nappsac.com

Since NAPPS has a mission of continuous product improvement, it reserves the right to change design or specifications without notice

Literature Order Number	NTC App Manual NCC-NWC-04
Supersedes	NTC App Manual NCC-NWC-03
Stocking Location	Longview, Texas