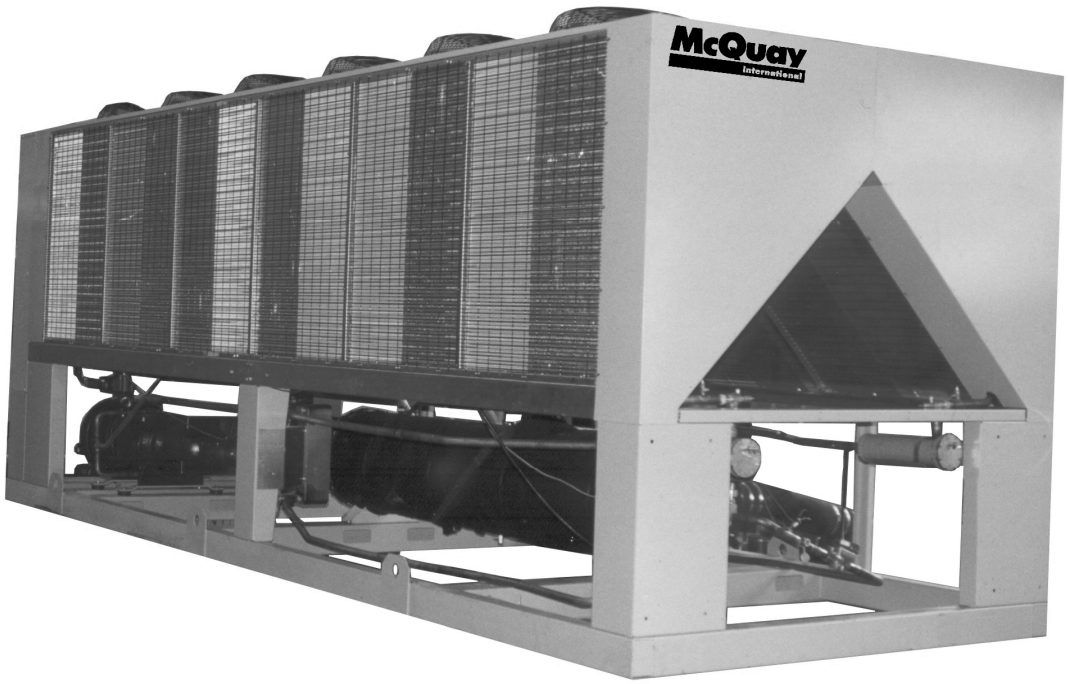
Installation and Maintenance Manual	IMM AGS-2
	Group: **Chiller**
	Part Number: **331373301**
	Date: **July 2008**
	Supersedes: **March 2008**

Air-Cooled Screw Compressor Chiller

AGS 120CS/H - AGS 210CS/H, Packaged

AGS 120CM/B – AHS 210CM/B, Remote Evaporator

60 Hertz, R-134a



McQuay®
Air Conditioning

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BMA BACnet MANUFACTURERS ASSOCIATION MEMBER

Manufactured in an **ISO** Certified Facility

LONMARK 3.3

Unit controllers are LONMARK certified with an optional LONWORKS communications module

Introduction

General Description

McQuay ***GeneSys™*** air-cooled water chillers are complete, self-contained automatic refrigerating units that include the latest in engineered components arranged to provide a compact and efficient unit. Each unit is completely assembled, factory wired, evacuated, charged, tested and comes complete and ready for installation. Each unit consists of two air-cooled condenser sections with integral subcooler sections, two semi-hermetic, single-screw compressors with solid-state starters, a two-circuit shell-and-tube direct expansion evaporator, and complete refrigerant piping. Each compressor has an independent refrigeration circuit. Liquid line components included are manual liquid line shutoff valves, charging ports, filter-driers, sight-glass/moisture indicators, solenoid valves and electronic expansion valves. A discharge shutoff valve is included and a compressor suction shutoff valve is optional. Other features include compressor heaters, evaporator heaters for freeze protection, automatic one-time pumpdown of each refrigerant circuit upon circuit shutdown, and an advanced fully integrated microprocessor control system.

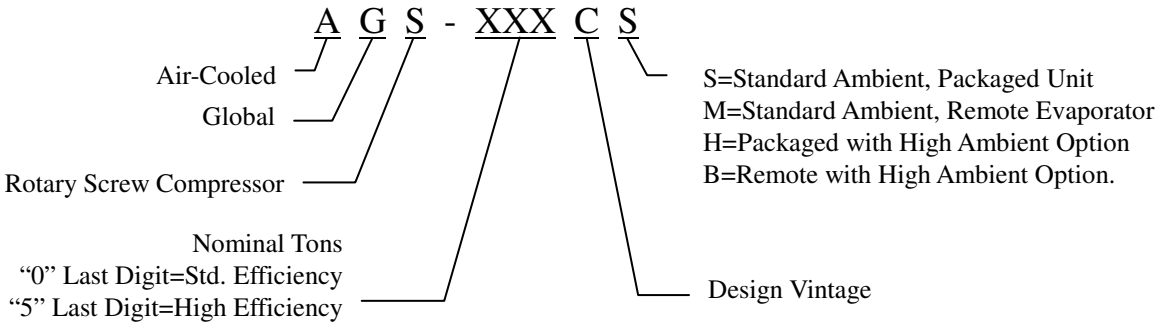
AGS units are divided between standard efficiency (model numbers ending in "0") and high efficiency units (ending in "5"). The high efficiency units have certain larger components.

The units are optionally available with the evaporator shipped separately for remote mounting indoors.

A high ambient option is required for operation in ambient temperatures above 115°F (46°C), or 105°F (41°C) on units equipped with optional fan VFDs.

Information on the operation of the unit MicroTech II controller is in the OM AGS manual.

Nomenclature



Inspection

When the equipment is received, carefully check all items against the bill of lading to check for a complete shipment. Check all units for damage upon arrival. All shipping damage must be reported to the carrier and a claim must be filed with the carrier. Check the unit's serial plate before unloading the unit to be sure that it agrees with the power supply available. Physical damage to unit after acceptance is not the responsibility of McQuay International.

Note: Unit shipping and operating weights are shown in the Physical Data Tables on page 26 for packaged units and page 60 for remote evaporator models.

⚠ WARNING

Sharp edges and coil surfaces are a potential injury hazard. Avoid contact with them.

Note: Installation and maintenance are to be performed only by qualified personnel who are familiar with local codes and regulations, and experienced with this type of equipment.

Start-up by McQuayService is included on all units sold for installation within the USA and Canada and must be performed by them to initiate the standard limited product warranty. Two-week prior notification of start-up is required. The contractor should obtain a copy of the Start-up Scheduled Request Form from the sales representative or from the nearest office of McQuayService.

⚠ WARNING

Escaping refrigerant can displace air and cause suffocation. Immediately evacuate and ventilate the equipment area. If the unit is damaged, follow Environmental Protection Agency (EPA) requirements. Do not expose sparks, arcing equipment, open flame or other ignition source to the refrigerant.

Handling

Avoid rough handling shock due to impact or dropping the unit. Do not push or pull the unit.

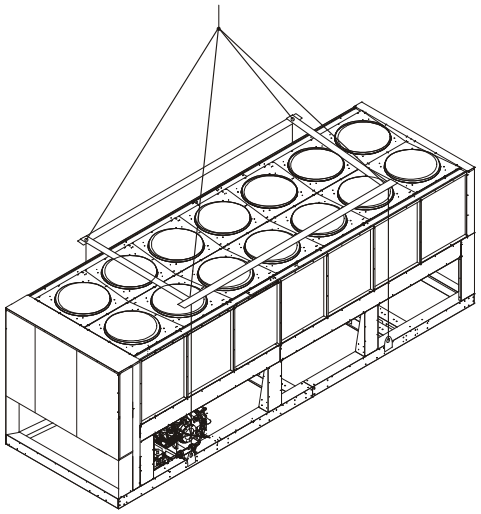
Never allow any part of the unit to fall during unloading or moving, as this can result in serious damage.

To lift the unit, lifting tabs with 2½" (64 mm) diameter holes are provided on the base of the unit. All lifting holes must be used when lifting the unit. Spreader bars and cables should be arranged to prevent damage to the condenser coils or unit cabinet (see Figure 1).

⚠ DANGER

Improper lifting or moving unit can result in property damage, severe personal injury or death. Follow rigging and moving instructions carefully.

Figure 1, Required Lifting Method



NOTES:

1. All rigging points on a unit must be used. See location and weights at lifting points beginning on page 13 for a specific size unit.
2. Crosswise and lengthwise spreader bars must be used to avoid damage to unit. Lifting cables from the unit mounting holes up must be vertical.
3. The number of condenser sections, and fans can vary from this diagram.

Location

Locate the unit carefully to provide proper airflow to the condenser. (See Figure 2 on page 6 for required clearances).

Due to the shape of the condenser coils on the AGS chillers, it is recommended that the unit be oriented so that prevailing winds blow parallel to the unit length, thus minimizing the wind effect on condensing pressure and performance. If low ambient temperature operation is expected, optional louvers should be installed if the unit has no protection against prevailing winds.

Using less clearance than shown in Figure 2 can cause discharge air recirculation to the condenser and could have a significant detrimental effect on unit performance.

See Restricted Airflow beginning on page 7 for further information.

For pad-mounted units, it is recommended that the unit be raised a few inches with suitable supports, located at least under the mounting locations, to allow water to drain from under the unit and to facilitate cleaning under it

Service Access

Compressors, filter-driers, and manual liquid line shutoff valves are accessible on each side or end of the unit. The evaporator heater is located on the barrel.

The control panels are located on the end of the chiller. The left-hand control box contains the unit and circuit microprocessors as well as transformers, fuses and terminal. The right-hand panel contains a circuit breaker and solid state starter for each compressor plus fuses, fan VFD (optional) and fan contactors. A minimum of four feet of clearance is required in front of the panels.

The side clearance required for airflow provides sufficient service clearance.

On all AGS units, the condenser fans and motors can be removed from the top of the unit. The complete fan/motor assembly can be removed for service. The fan blade must be removed for access to wiring terminals at the top of the motor.

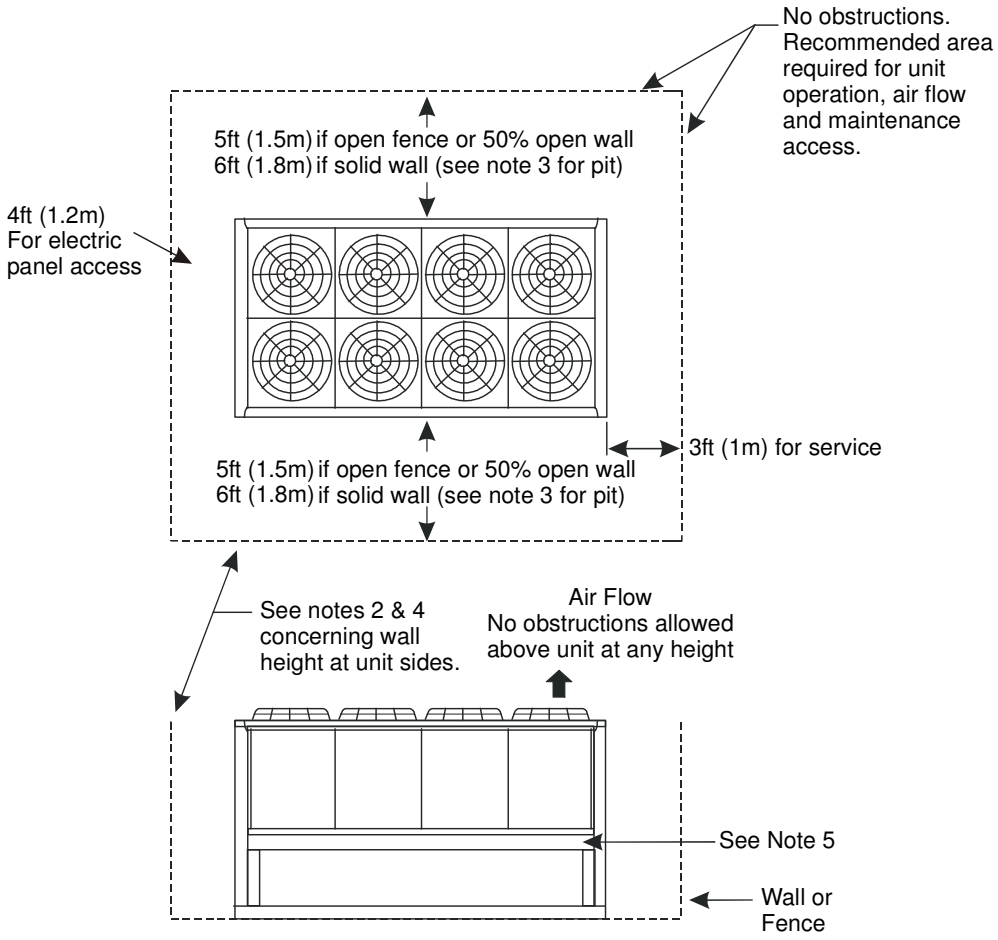
⚠ WARNING

Disconnect, lockout and tag all power to the unit before servicing condenser fan motors or compressors.
Failure to do so can cause bodily injury or death.

Do not block access to the sides or ends of the unit with piping or conduit. These areas must be open for service access. Do not block any access to the control panels with a field-mounted disconnect switches.

Clearance Requirements

Figure 2, Clearance Requirements, AGS 120C – AGS 210C



Notes:

1. Minimum side clearance between two units is 12 feet (3.7 meters).
2. Unit must not be installed in a pit or enclosure that is deeper or taller than the height of the unit unless extra clearance is provided per note 4.
3. Minimum clearance on each side is 8 feet (2.4 meters) when installed in a pit no deeper than the unit height.
4. Minimum side clearance to a side wall or building taller than the unit height is 6 feet (1.8 meters), provided no solid wall above 6 feet (1.8 meters) is closer than 12 feet (3.7 meters) to the opposite side of the unit.
5. Do not mount electrical conduits where they can block service access to compressor controls, refrigerant driers or valves.
6. There must be no obstruction of the fan discharge.
7. Field installed switches must not interfere with service access or airflow.
8. The evaporator can be removed from the side of the unit and may require the temporary removal of a coil section support post. See dimension drawings beginning on page 29 for details.
9. If the airflow clearances cannot be met, see the following pages on Restricted Airflow.

Restricted Airflow

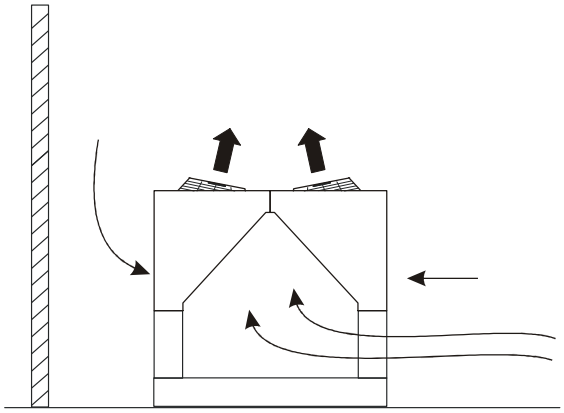
General

The clearances required for design operation of AGS air-cooled condensers are described in the previous section. Occasionally, these clearances cannot be maintained due to site restrictions such as units being too close together or a fence or wall restricting airflow, or both.

The McQuay AGS chillers have several features that can mitigate the problems attributable to restricted airflow.

- The shape of the condenser section allows inlet air for these coils to come in from both sides and the bottom. All the coils on one side serve one compressor. Every compressor always has its own independent refrigerant circuit.
- The MicroTech II™ control is proactive in response to off-design conditions. In the case of single or compounded influences restricting airflow to the unit, the microprocessor will act to keep the compressor(s) running (at reduced capacity) as long as possible, rather than allowing a shut-off on high discharge pressure.

Figure 3, Coil and Fan Arrangement



The following sections discuss the most common situations of condenser air restriction and give capacity and power adjustment factors for each. Note that in unusually severe conditions, the MicroTech II controller will adjust the unit operation to remain online until a less severe condition is reached.

Case 1, Building or Wall on One Side of One Unit

The existence of a screening wall, or the wall of a building, in close proximity to an air-cooled chiller is common in both rooftop and ground level applications. Hot air recirculation on the coils adjoining the wall will increase compressor discharge pressure, decreasing capacity and increasing power consumption.

When close to a wall, it is desirable to place chillers on the north or east side of them. It is also desirable to have prevailing winds blowing parallel to the unit's long axis. The worst case is to have wind blowing hot discharge air into the wall.

Figure 4, Unit Adjacent to Wall

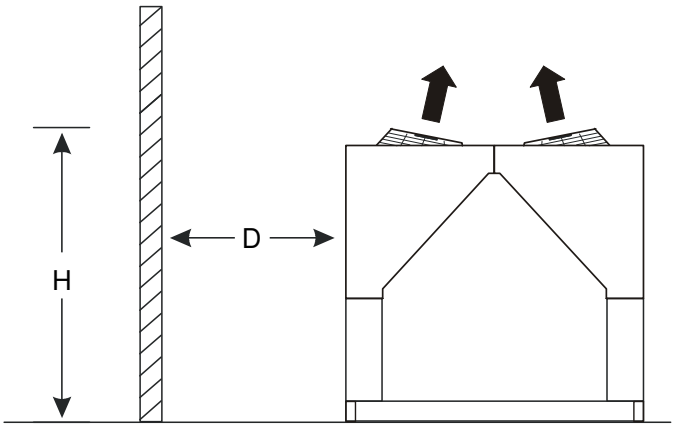
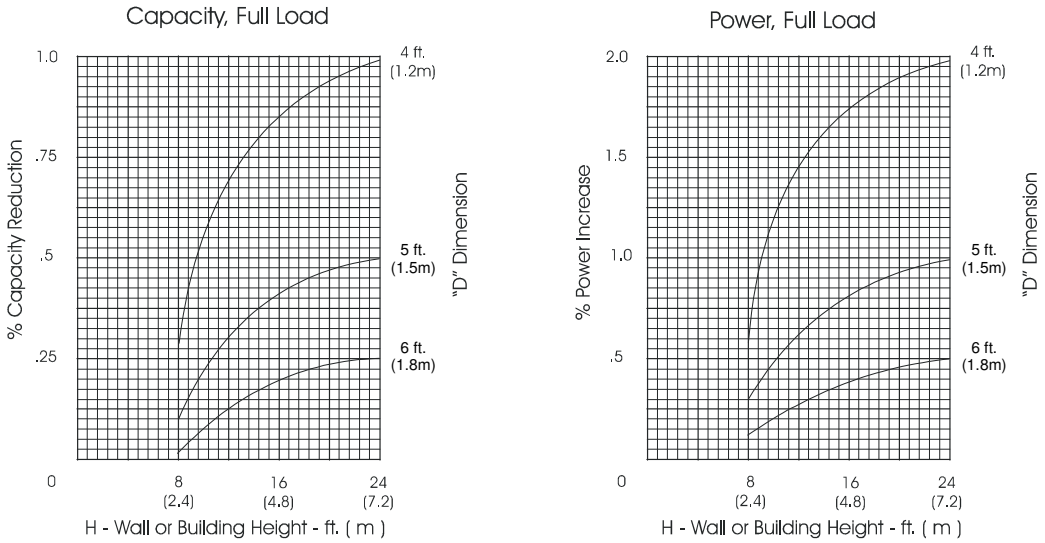


Figure 5, Adjustment Factors



Case 2, Two Units Side By Side

Two or more units sited side by side are common. If spaced closer than 12 feet (3.7 meters), or 8 feet (2.5 meters), depending on size, it is necessary to adjust the performance of each unit. Circuits adjoining each other are affected. **NOTE:** This case applies only to *two* units side by side. See Case 3 for three or more parallel units. If one of the two units also has a wall adjoining it, see Case 1. Add the two adjustment factors together and apply to the unit located between the wall and the other unit.

Mounting units end to end will not necessitate adjusting performance. Depending on the actual arrangement, sufficient space must be left between the units for access to the control panel door opening and/or evaporator tube removal. See "Clearance" section of this guide for requirements for specific units.

Figure 6, Two Units Side by Side

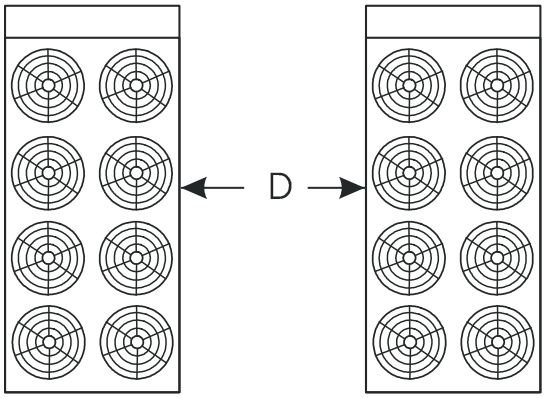
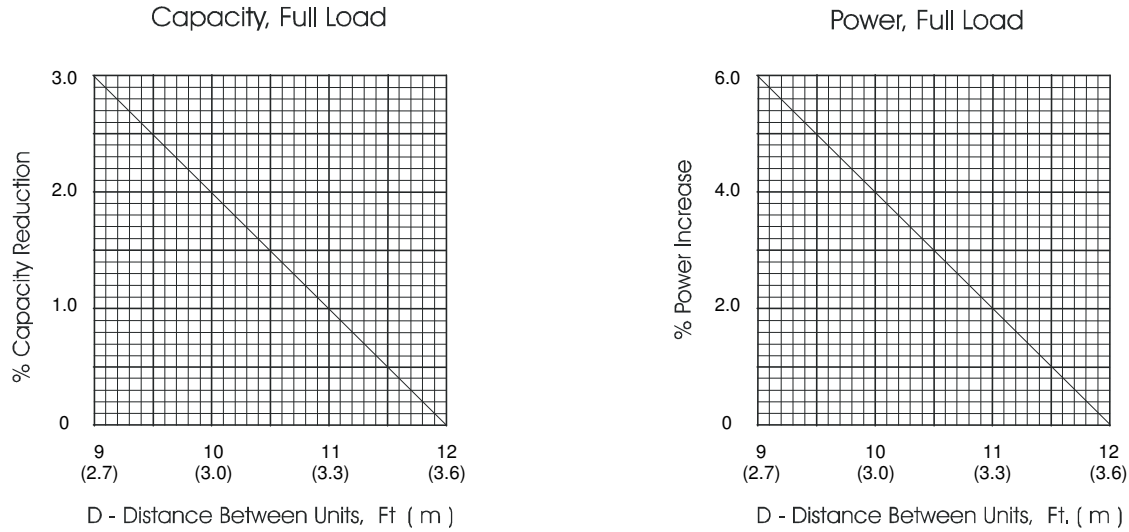


Figure 7, Adjustment Factor



Case 3, Three or More Units Side By Side

When three or more units are side by side, the outside units (chillers 1 and 3 in this case) are influenced by the middle unit only on their inside circuits. Their adjustment factors will be the same as Case 2. All inside units (only chiller 2 in this case) are influenced on both sides and must be adjusted by the factors shown below.

Figure 8, Three or More Units

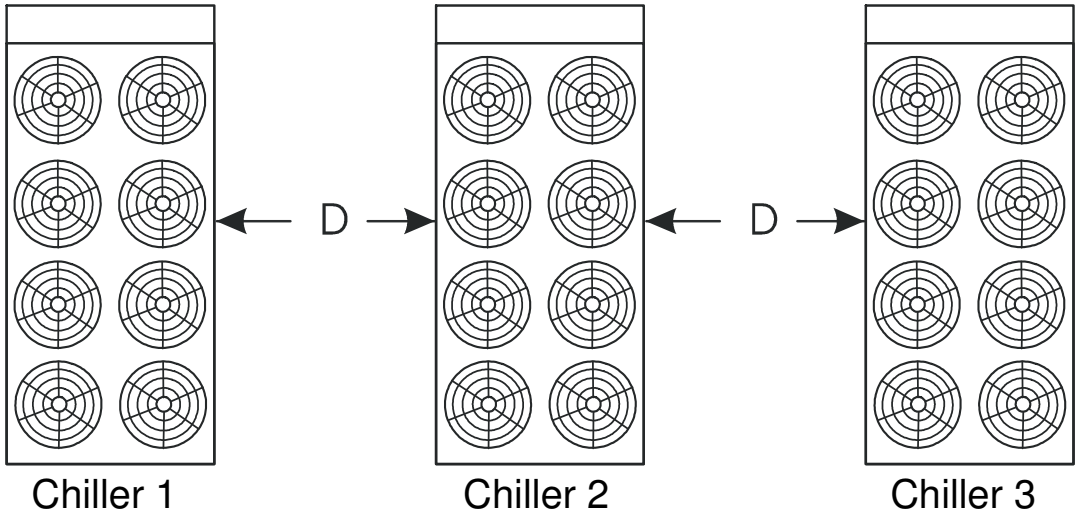
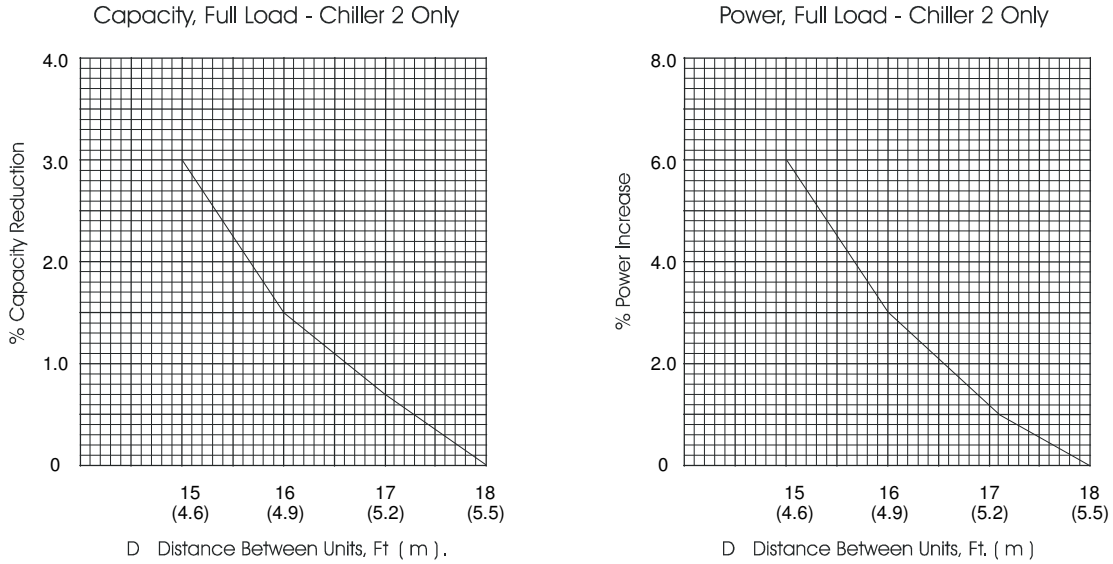


Figure 9, Adjustment Factor



Case 4, Open Screening Walls

Decorative screening walls are often used to help conceal a unit either on grade or on a rooftop. These walls should be designed such that the combination of their open area and distance from the unit do not require performance adjustment. It is assumed that the wall height is equal to or less than the unit height when mounted on its base support. This is usually satisfactory for concealment. If the wall height is greater than the unit height, see Case 5, Pit Installation.

The distance from the ends of the unit to the end walls must be sufficient for service, opening control panel doors, and pulling evaporator tubes, as applicable.

If each side wall is a different distance from the unit, the distances can be averaged, providing either wall is not less than 8 feet (2.4 meters) from the unit. For example, do not average 4 feet and 20 feet to equal 12 feet.

Figure 10, Open Screening Walls

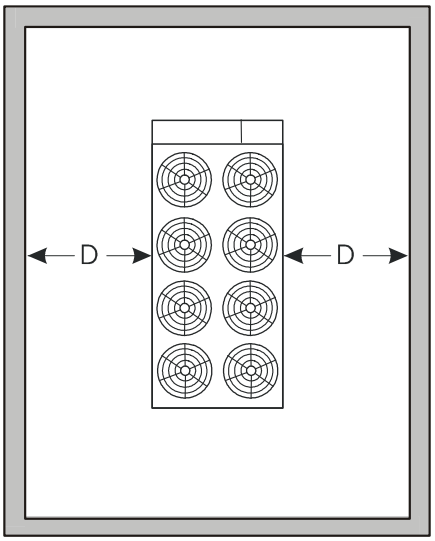
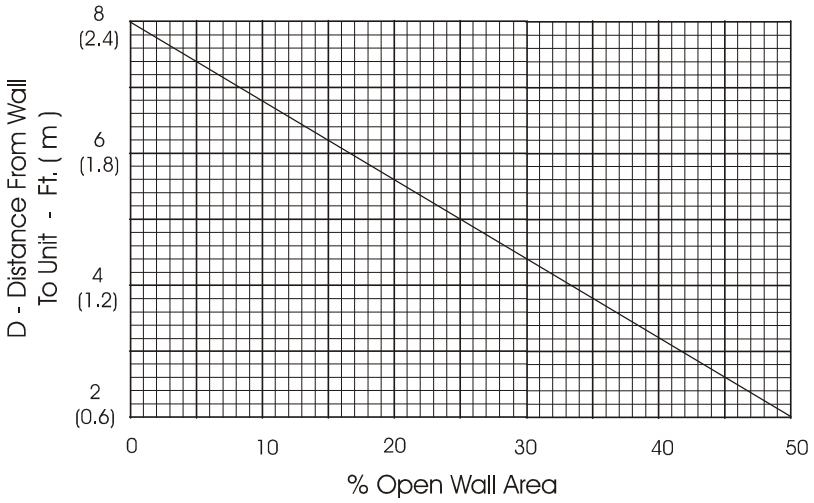


Figure 11, Wall Free Area vs. Distance



Case 5, Pit/Solid Wall Installation

Pit installations can cause operating problems and great care must be exercised if they are to be used on an installation. Recirculation and restriction can both occur. A solid wall surrounding a unit is substantially the same as a pit and the data presented in this case should be used.

Steel grating is sometimes used to cover a pit to prevent accidental falls or trips into the pit. The grating material and installation design must be strong enough to prevent such accidents, yet provide abundant open area or serious recirculation problems will occur. Have any pit installation reviewed by the McQuay sales office prior to installation to discuss whether it has sufficient airflow characteristics. The installation design engineer must approve the work and is responsible for design criteria.

Figure 12, Pit Installation

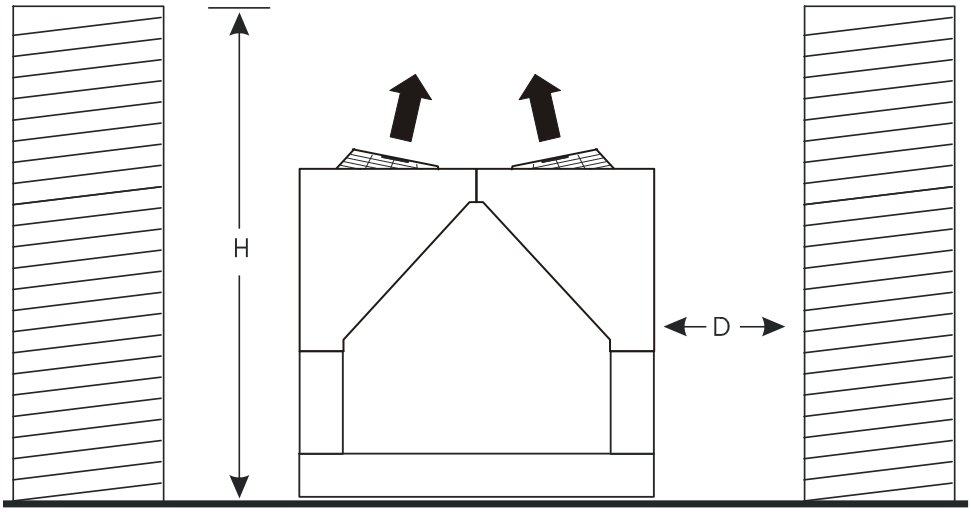
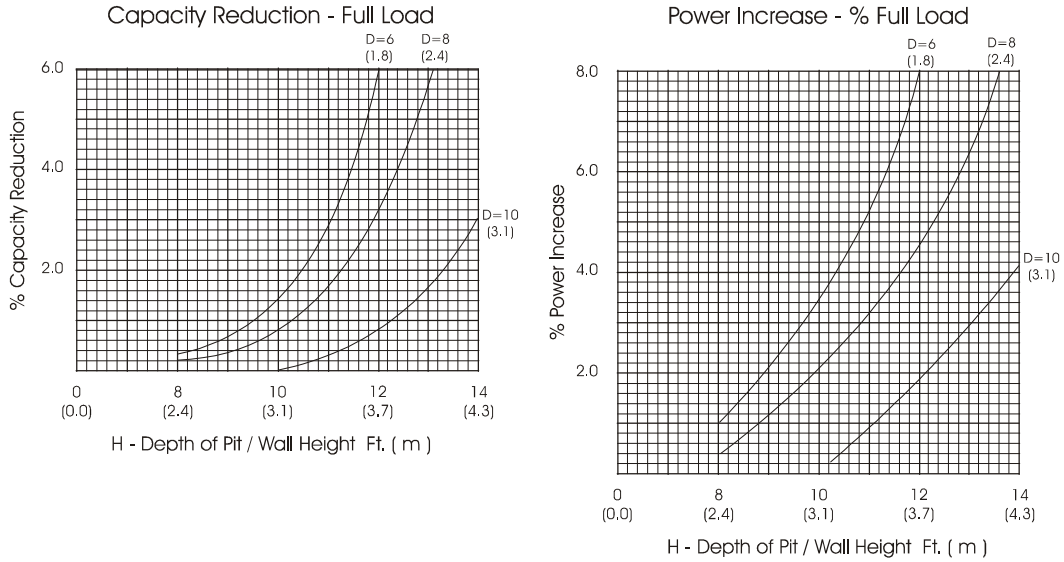


Figure 13, Adjustment Factor



Vibration Isolators

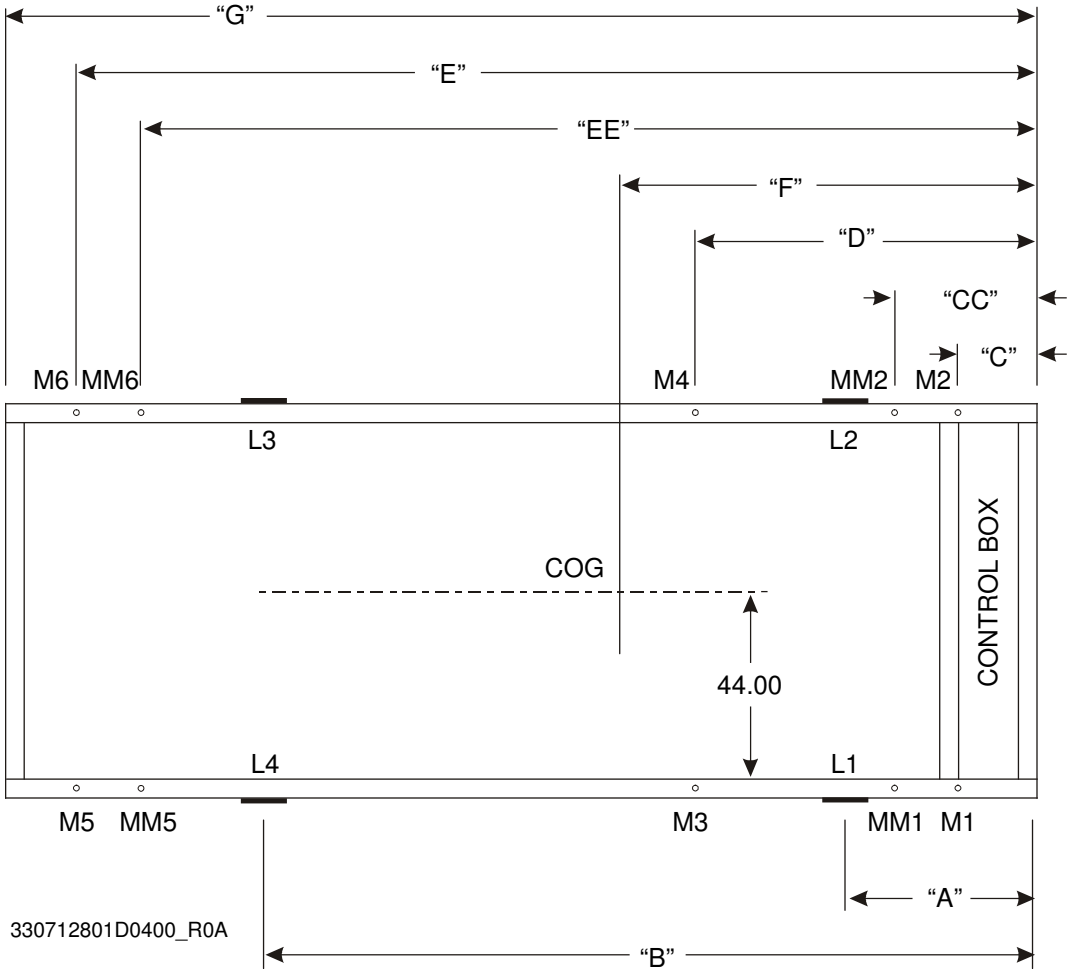
Vibration isolators are recommended for all roof-mounted installations or wherever vibration transmission is a consideration. Initially installed the unit on shims or blocks at the illustrated "free height" of the isolator that is six inches for the McQuay isolators shown. When all piping, wiring, flushing, charging, etc. is complete, adjust the springs upward to load them and to provide clearance to free the blocks, which are then removed.

Installation of spring isolators requires flexible pipe connections and at least three feet of conduit flex tie-ins. Support piping and conduit independently from the unit to not stress connections.

There are separate weight and isolator tables for copper fin coils. All other coil types, such as ElectroFin and Blackfin, use the aluminum fin data.

Isolator bolting: the unit base is an enclosed box design and may have six or ten mounting locations, depending on the date of manufacture. Mounting locations M1 and M2 at dimension “C” and locations M5 and M6 at dimension “E” are not used. Locations MM1, MM2, M3, M4, MM5 and MM6 have access holes on top of the base, above the lower mounting holes and should be used for all isolator types. One simple method of bolting the base to the isolators (if required) is to remove the short threaded studs, usually provided with isolators, and replace them with eight-inch threaded rod. The rod will extend above the top of the base and a washer and nut can then be easily attached.

Figure 14, Mounting and Lifting Dimensions



NOTE: Dimensions are on the following page.

Table 1, Dimensions

MODEL	A	B	C	CC	D	E	EE	F	G
120	36.00	136.60	12.00	21.00	57.30	174.60	165.60	71.49	186.60
125	36.00	168.85	12.00	21.00	69.25	212.80	203.80	86.54	224.80
130	36.00	136.60	12.00	21.00	57.30	174.60	165.60	71.49	186.60
135	36.00	168.85	12.00	21.00	69.25	212.80	203.80	86.54	224.80
140	36.00	136.60	12.00	21.00	57.30	174.60	165.80	71.49	186.60
145	36.00	168.85	12.00	21.00	69.25	212.80	203.80	86.66	224.80
160	36.00	136.60	12.00	21.00	57.30	174.60	165.60	74.37	186.60
165	36.00	189.00	12.00	21.00	84.00	251.00	242.00	105.17	263.00
170	36.00	168.85	12.00	21.00	69.25	212.80	203.80	89.65	224.80
175	36.00	189.00	12.00	21.00	84.00	251.00	242.00	105.17	263.00
180	36.00	168.85	12.00	21.00	69.25	212.80	203.80	89.65	224.80
190	36.00	168.85	12.00	21.00	69.25	212.80	203.80	89.65	224.80
195	36.00	189.00	12.00	21.00	84.00	251.00	242.00	105.17	263.00
210	36.00	189.00	12.00	21.00	84.00	251.00	242.00	105.17	263.00

NOTES:
1. Use location “C”, not “CC”, for mounting.
2. Center of gravity (F) is calculated from shipping weight
3. Dimensions are in inches.
4. Mounting holes are 0.75 inch diameter and have center located 2.0 inches from the outside edge.

Table 2, Lifting and Mounting Weights, Packaged, Aluminum Fins, AGS-CS/H

AGS	Lifting Weights				Mounting Weights						Operating Weight		Shipping Weight	
	L1, L2		L3, L4		MM1, MM2		M3, M4		MM5, MM6					
	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg
120	2919	1324	1591	722	1749	793	1645	746	1333	605	9452	4287	9020	4091
125	3161	1434	1941	880	1996	905	1887	856	1583	718	10930	4958	10205	4629
130	2919	1324	1591	722	1749	793	1645	746	1333	605	9452	4287	9020	4091
135	3161	1434	1941	880	1996	905	1887	856	1583	718	10930	4958	10205	4629
140	2919	1324	1591	722	1749	793	1645	746	1333	605	9452	4287	9020	4091
145	3075	1395	1896	860	1916	869	1810	821	1517	688	10485	4756	9942	4510
160	2933	1330	1809	821	1802	817	1742	790	1561	708	10209	4631	9484	4302
165	3017	1369	2489	1129	2137	969	2038	924	1789	811	11928	5411	11011	4995
170	3269	1483	2007	910	1945	882	1904	864	1790	812	11277	5115	10552	4786
175	3017	1369	2489	1129	2137	969	2038	924	1789	811	11928	5411	11011	4995
180	3269	1483	2007	910	1945	882	1904	864	1790	812	11277	5115	10552	4786
190	3269	1483	2007	910	1945	882	1904	864	1790	812	11277	5115	10552	4786
195	3017	1369	2489	1129	2137	969	2038	924	1789	811	11928	5411	11011	4995
210	3017	1369	2489	1129	2137	969	2038	924	1789	811	11928	5411	11011	4995

Table 3, Lifting and Mounting Weights, Packaged Copper Fins, AGS-CS/H

AGS	Lifting Weights				Mounting Weights						Operating Weight		Shipping Weight	
	L1, L2		L3, L4		MM1, MM2		M3, M4		MM5, MM6					
	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg
120	3557	1613	2229	1011	2174	986	2070	939	1758	798	10728	4866	10296	4670
125	3959	1796	2739	1242	2528	1147	2419	1097	2115	959	12526	5682	11801	5353
130	3557	1613	2229	1011	2174	986	2070	939	1758	798	10728	4866	10296	4670
135	3959	1796	2739	1242	2528	1147	2419	1097	2115	959	12526	5682	11801	5353
140	3557	1613	2229	1011	2174	986	2070	939	1758	798	10728	4866	10296	4670
145	3873	1757	2694	1222	2448	1110	2342	1062	2049	929	12081	5480	11538	5234
160	3571	1620	2447	1110	2227	1010	2167	983	1986	901	11485	5210	10760	4881
165	3975	1803	3447	1564	2776	1259	2677	1214	2428	1101	13844	6280	12927	5864
170	4067	1845	2805	1272	2477	1124	2436	1105	2322	1053	12873	5839	12148	5510
175	3975	1803	3447	1564	2776	1259	2677	1214	2428	1101	13844	6280	12927	5864
180	4067	1845	2805	1272	2477	1124	2436	1105	2322	1053	12873	5839	12148	5510
190	4067	1845	2805	1272	2477	1124	2436	1105	2322	1053	12873	5839	12148	5510
195	3975	1803	3447	1564	2776	1259	2677	1214	2428	1101	13844	6280	12927	5864
210	3975	1803	3447	1564	2776	1259	2677	1214	2428	1101	13844	6280	12927	5864

Table 4, Lifting & Mounting Weights, Remote Evaporator, Aluminum Fins, AGS-CM/B

AGS	Lifting Weights				Mounting Weights						Operating Weight		Shipping Weight	
	L1, L2		L3, L4		MM1, MM2		M3, M4		MM5, MM6					
	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg
120	3029	1374	1021	463	1780	807	1521	690	749	340	8100	3674	8100	3674
125	3169	1437	1307	593	1938	879	1659	753	879	399	8952	4061	8952	4061
130	3029	1374	1021	463	1780	807	1521	690	749	340	8100	3674	8100	3674
135	3169	1437	1307	593	1938	879	1659	753	879	399	8952	4061	8952	4061
140	3029	1374	1021	463	1780	807	1521	690	749	340	8100	3674	8100	3674
145	3169	1437	1307	593	1938	879	1659	753	879	399	8952	4061	8952	4061
160	3029	1374	1021	463	1780	807	1521	690	749	340	8100	3674	8100	3674
165	3196	1450	1590	721	2099	952	1764	800	923	419	9571	4341	9571	4341
170	3169	1437	1307	593	1938	879	1659	753	879	399	8952	4061	8952	4061
175	3196	1450	1590	721	2099	952	1764	800	923	419	9571	4341	9571	4341
180	3169	1437	1307	593	1938	879	1659	753	879	399	8952	4061	8952	4061
190	3169	1437	1307	593	1938	879	1659	753	879	399	8952	4061	8952	4061
195	3196	1450	1590	721	2099	952	1764	800	923	419	9571	4341	9571	4341
210	3196	1450	1590	721	2099	952	1764	800	923	419	9571	4341	9571	4341

Table 5, Lifting & Mounting Weights, Remote Evaporator, Copper Fins, AGS-CM/B

AGS	Lifting Weights				Mounting Weights						Operating Weight		Shipping Weight	
	L1, L2		L3, L4		MM1, MM2		M3, M4		MM5, MM6					
	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg	lbs	kg
120	3667	1663	1659	753	2205	1000	1946	883	1174	533	9376	4253	9376	4253
125	3967	1799	2105	955	2470	1120	2191	994	1411	640	10548	4785	10548	4785
130	3667	1663	1659	753	2205	1000	1946	883	1174	533	9376	4253	9376	4253
135	3967	1799	2105	955	2470	1120	2191	994	1411	640	10548	4785	10548	4785
140	3667	1663	1659	753	2205	1000	1946	883	1174	533	9376	4253	9376	4253
145	3967	1799	2105	955	2470	1120	2191	994	1411	640	10548	4785	10548	4785
160	3667	1663	1659	753	2205	1000	1946	883	1174	533	9376	4253	9376	4253
165	4154	1884	2548	1156	2738	1242	2403	1090	1562	708	11487	5211	11487	5211
170	3967	1799	2105	955	2470	1120	2191	994	1411	640	10548	4785	10548	4785
175	4154	1884	2548	1156	2738	1242	2403	1090	1562	708	11487	5211	11487	5211
180	3967	1799	2105	955	2470	1120	2191	994	1411	640	10548	4785	10548	4785
190	3967	1799	2105	955	2470	1120	2191	994	1411	640	10548	4785	10548	4785
195	4154	1884	2548	1156	2738	1242	2403	1090	1562	708	11487	5211	11487	5211
210	4154	1884	2548	1156	2738	1242	2403	1090	1562	708	11487	5211	11487	5211

Table 6, Spring Vibration Isolators, Aluminum Fin, AGS-CS/H

AGS Model	Mounting Location						
	M1	M2	M3	M4	M5	M6	Kit Number
120	CP2-28	CP2-28	CP2-28	CP2-28	CP2-27	CP2-27	330904101
	GREEN	GREEN	GREEN	GREEN	ORANGE	ORANGE	
125	CP2-31	CP2-31	CP2-31	CP2-31	CP2-28	CP2-28	330904102
	GRAY	GRAY	GRAY	GRAY	GREEN	GREEN	
130	CP2-28	CP2-28	CP2-28	CP2-28	CP2-27	CP2-27	330904101
	GREEN	GREEN	GREEN	GREEN	ORANGE	ORANGE	
135	CP2-31	CP2-31	CP2-31	CP2-31	CP2-28	CP2-28	330904102
	GRAY	GRAY	GRAY	GRAY	GREEN	GREEN	
140	CP2-28	CP2-28	CP2-28	CP2-28	CP2-27	CP2-27	330904101
	GREEN	GREEN	GREEN	GREEN	ORANGE	ORANGE	
145	CP2-31	CP2-31	CP2-31	CP2-31	CP2-28	CP2-28	330904102
	GRAY	GRAY	GRAY	GRAY	GREEN	GREEN	
160	CP2-28	CP2-28	CP2-28	CP2-28	CP2-28	CP2-28	330904103
	GREEN	GREEN	GREEN	GREEN	GREEN	GREEN	
165	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	330904104
	GRAY	GRAY	GRAY	GRAY	GRAY	GRAY	
170	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	
	GRAY	GRAY	GRAY	GRAY	GRAY	GRAY	
175	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	
	GRAY	GRAY	GRAY	GRAY	GRAY	GRAY	
180	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	
	GRAY	GRAY	GRAY	GRAY	GRAY	GRAY	
190	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	
	GRAY	GRAY	GRAY	GRAY	GRAY	GRAY	
195	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	
	GRAY	GRAY	GRAY	GRAY	GRAY	GRAY	
210	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	
	GRAY	GRAY	GRAY	GRAY	GRAY	GRAY	

Table 7, Neoprene-in-Shear Isolators, Aluminum Fin, AGS-CS/H

AGS Model	Mounting Location (See Footprint Drawings, page 13)						
	M1	M2	M3	M4	M5	M6	Kit Number
120	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, BLACK	RP-4, BLACK	330904111
125	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	330904112
130	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, BLACK	RP-4, BLACK	330904111
135	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	330904112
140	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, BLACK	RP-4, BLACK	330904111
145	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	330904112
160	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
165	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
170	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
175	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
180	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
190	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
195	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
210	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	

Table 8, Spring Vibration Isolators, Copper Fin, AGS-CS/H

AGS Model	Mounting Location						
	M1	M2	M3	M4	M5	M6	Kit Number
120	CP2-31	CP2-31	CP2-31	CP2-31	CP2-28	CP2-28	330904102
	GRAY	GRAY	GRAY	GRAY	GREEN	GREEN	
125	CP2-32	CP2-32	CP2-31	CP2-31	CP2-31	CP2-31	330904105
	WHITE	WHITE	GRAY	GRAY	GRAY	GRAY	
130	CP2-31	CP2-31	CP2-31	CP2-31	CP2-28	CP2-28	330904102
	GRAY	GRAY	GRAY	GRAY	GREEN	GREEN	
135	CP2-32	CP2-32	CP2-31	CP2-31	CP2-31	CP2-31	330904105
	WHITE	WHITE	GRAY	GRAY	GRAY	GRAY	
140	CP2-31	CP2-31	CP2-31	CP2-31	CP2-28	CP2-28	330904102
	GRAY	GRAY	GRAY	GRAY	GREEN	GREEN	
145	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	330904104
	GRAY	GRAY	GRAY	GRAY	GRAY	GRAY	
160	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	330904104
	GRAY	GRAY	GRAY	GRAY	GRAY	GRAY	
165	CP2-32	CP2-32	CP2-32	CP2-32	CP2-31	CP2-31	330904106
	WHITE	WHITE	WHITE	WHITE	GRAY	GRAY	
170	CP2-32	CP2-32	CP2-31	CP2-31	CP2-31	CP2-31	330904105
	WHITE	WHITE	GRAY	GRAY	GRAY	GRAY	
175	CP2-32	CP2-32	CP2-32	CP2-32	CP2-31	CP2-31	330904106
	WHITE	WHITE	WHITE	WHITE	GRAY	GRAY	
180	CP2-32	CP2-32	CP2-31	CP2-31	CP2-31	CP2-31	330904105
	WHITE	WHITE	GRAY	GRAY	GRAY	GRAY	
190	CP2-32	CP2-32	CP2-31	CP2-31	CP2-31	CP2-31	330904105
	WHITE	WHITE	GRAY	GRAY	GRAY	GRAY	
195	CP2-32	CP2-32	CP2-32	CP2-32	CP2-31	CP2-31	330904106
	WHITE	WHITE	WHITE	WHITE	GRAY	GRAY	
210	CP2-32	CP2-32	CP2-32	CP2-32	CP2-31	CP2-31	330904106
	WHITE	WHITE	WHITE	WHITE	GRAY	GRAY	

Table 9, Neoprene-in-Shear Isolators, Copper Fin, AGS-CS/H

AGS Model	Mounting Location (See Footprint Drawing, pg. 13)						
	M1	M2	M3	M4	M5	M6	Kit Number
120	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	330904112
125	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
130	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
135	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
140	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
145	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
160	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
165	RP-4, GRN	RP-4, GRN	RP-4, GRN	RP-4, GRN	RP-4, RED	RP-4, RED	330904113
170	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	330904112
175	RP-4, GRN	RP-4, GRN	RP-4, GRN	RP-4, GRN	RP-4, RED	RP-4, RED	330904113
180	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	330904112
190	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
195	RP-4, GRN	RP-4, GRN	RP-4, GRN	RP-4, GRN	RP-4, RED	RP-4, RED	330904113
210	RP-4, GRN	RP-4, GRN	RP-4, GRN	RP-4, GRN	RP-4, RED	RP-4, RED	

Table 10, Spring Flex Isolators

Housing	Spring Color	Max. Load Each Lbs. (kg)	Defl. In. (mm)	Dimensions In. (mm)					Housing Part Number	Spring Part Number
				A	B	C	D	E		
CP-2-27	Orange	1500 (681)	0.5 (12.7)	10.2 (259.1)	9.0 (228.6)	7.7 (195.6)	2.7 (68.6)	5.75 (146.0)	226103B-00	(2) 226117A-00
CP-2-28	Green	1800 (815)	0.5 (12.7)	10.2 (259.1)	9.0 (228.6)	7.7 (195.6)	2.7 (68.6)	5.75 (146.0)	226103B-00	(2) 226118A-00
CP-2-31	Gray	2200 (998)	0.5 (12.7)	10.2 (259.1)	9.0 (228.6)	7.7 (195.6)	2.7 (68.6)	5.75 (146.0)	226103B-00	(2) 226119A-00
CP-2-32	White	2600 (1180)	0.5 (12.7)	10.2 (259.1)	9.0 (228.6)	7.7 (195.6)	2.7 (68.6)	5.75 (146.0)	226103B-00	(2) 226120A-00

Table 11, Neoprene-in-Shear Isolators

Type		Max. Load Each Lbs. (kg)	Defl. In. (mm)	Dimensions In. (mm)								McQuay Part Number
				A	B	C	D (1)	E	H	L	W	
RP-4	Black	1500 (681)	0.25 (6.4)	3.75 (95.3)	0.5 (12.7)	5.0 (127.0)	0.56 (14.2)	0.25 (6.4)	1.6 (41.1)	6.5 (165.1)	4.6 (116.8)	216398A-04
RP-4	Red	2250 (1019)	0.25 (6.4)	3.75 (95.3)	0.5 (12.7)	5.0 (127.0)	0.56 (14.2)	0.25 (6.4)	1.6 (41.1)	6.5 (165.1)	4.6 (116.8)	216398A-01
RP-4	Green	3300 (1497)	0.25 (6.4)	3.75 (95.3)	0.5 (12.7)	5.0 (127.0)	0.56 (14.2)	0.25 (6.4)	1.6 (41.1)	6.5 (165.1)	4.6 (116.8)	216398A-03

Note (1) "D" is the mounting hole diameter.

Figure 15, Spring Flex Mountings

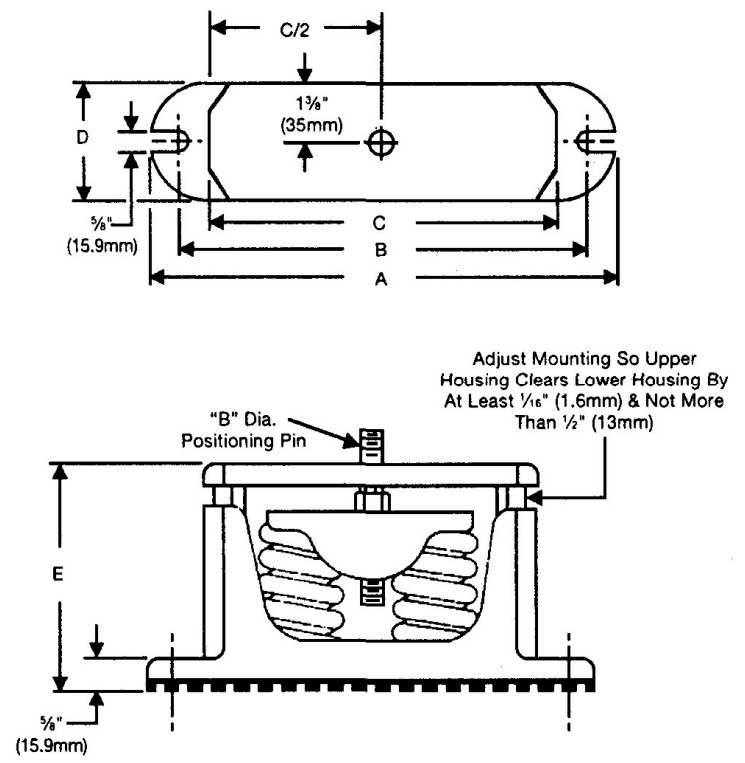
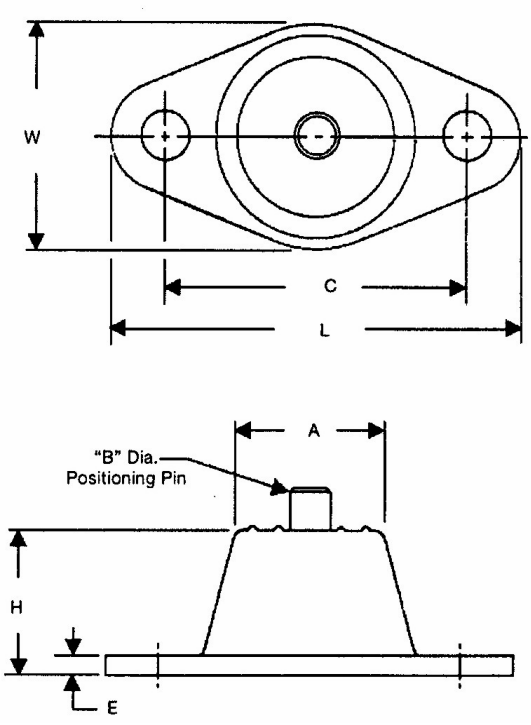


Figure 16, Single Neoprene-in-Shear Mounting



Chilled Water Pump

It is recommended that the chilled water pumps' starters be wired to, and controlled by, the chiller's microprocessor. The controller will energize the pump whenever at least one circuit on the chiller is *enabled* to run, whether there is a call for cooling or not. Wiring connection points are shown in Figure 23 on page 42.

Water Piping

Due to the variety of piping practices, follow the recommendations of local authorities. They can supply the installer with the proper building and safety codes required for a proper installation.

Design the piping with a minimum number of bends and changes in elevation to keep system cost down and performance up. It should contain:

1. Vibration eliminators to reduce vibration and noise transmission to the building.
2. Shutoff valves to isolate the unit from the piping system during unit servicing.
3. Manual or automatic air vent valves at the high points of the system and drains at the low parts in the system. The evaporator should not be the highest point in the piping system.
4. Some means of maintaining adequate system water pressure (i.e., expansion tank or regulating valve).
5. Water temperature and pressure indicators located at the evaporator inlet and outlet to aid in unit servicing. Any connections should be made prior to filling the system with water.
6. A strainer to remove foreign matter from the water before it enters the pump. Place the strainer far enough upstream to prevent cavitation at the pump inlet (consult pump manufacturer for recommendations). The use of a strainer will prolong pump life and help maintain high system performance levels.

NOTE: A 40 mesh strainer must also be placed in the supply water line just prior to the inlet of the evaporator. This will aid in preventing foreign material from entering the evaporator and causing damage or decreasing its performance. Care must also be exercised if welding pipe or flanges to the evaporator connections to prevent any weld slag from entering the vessel.

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7. Any water piping to the unit must be protected to prevent freeze-up if below freezing temperatures are expected.

⚠ CAUTION

If a separate disconnect is used for the 115V supply to the unit, it should power the entire control circuit, not just the evaporator heaters. It should be clearly marked so that it is not accidentally shut off during cold seasons. Freeze damage to the evaporator could result. If the evaporator is drained for winter freeze protection, the heaters must be *de-energized* to prevent burnout.

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8. If the unit is used as a replacement chiller on a previously existing piping system, flush the system thoroughly prior to unit installation. Perform regular chilled water analysis and chemical water treatment immediately at equipment start-up.

9. In the event glycol is added to the water system as a late addition for freeze protection, recognize that the refrigerant suction pressure will be lower, cooling performance less, and water side pressure drop greater. If the percentage of glycol is large, or if propylene is employed in lieu of ethylene glycol, the added pressure drop and loss of performance could be substantial.
10. For ice making or low temperature glycol operation, a different freezestat pressure value is usually required. The freezestat setting can be manually changed through the MicroTech II controller.

Make a preliminary leak check prior to insulating the water piping and filling the system.

Include a vapor barrier with the piping insulation to prevent moisture condensation and possible damage to the building structure. It is important to have the vapor barrier on the outside of the insulation to prevent condensation within the insulation on the cold surface of the pipe.

System Water Volume

It is important to have adequate water volume in the system to provide an opportunity for the chiller to sense a load change, adjust to the change and stabilize. As the expected load change becomes more rapid, a greater water volume is needed. The system water volume is the total amount of water in the evaporator, air handling products and chilled water piping. If the water volume is too low, operational problems can occur including rapid compressor cycling, rapid loading and unloading of compressors, erratic refrigerant flow in the chiller, improper motor cooling, shortened equipment life and other undesirable consequences.

For normal comfort cooling applications where the cooling load changes relatively slowly, a minimum system volume of three minutes times the flow rate (gpm) is recommend. For example, if the design chiller flow rate is 400 gpm, we recommend a minimum total system volume of 1200 gallons (400 gpm x 3 minutes).

For process applications, such as a quenching tank, where the cooling load can change rapidly, additional system water volume is needed. The load would be very stable until the hot material is immersed in the water tank. Then, the load would increase drastically. For this type of application, system volume can need to be increased.

Since there are many other factors that can influence performance, systems can successfully operate below these suggestions. However, as the water volume decreases below these suggestions, the possibility of problems increases.

Variable Speed Pumping

Variable water flow involves reducing the water flow through the evaporator as the load decreases. McQuay chillers are designed for this duty, provided that the rate of change in water flow is slow, and the minimum and maximum flow rates for the vessel are not exceeded.

The recommended maximum change in water flow is 10 percent of the change per minute.

The water flow through the vessel must remain between the minimum and maximum values listed on page 25. If flow drops below the minimum allowable, large reductions in heat transfer can occur. If the flow exceeds the maximum rate, excessive pressure drop and tube erosion can occur.

Evaporator Freeze Protection

AGS chillers are equipped with thermostatically controlled evaporator heaters that help protect against freeze-up down to -20°F (-28°C).

NOTE: The heaters come from the factory connected to the control power circuit. The control power can be rewired in the field to a separate 115V supply (do not wire directly to the heater). See the field wiring diagram on page 42. If this is done, mark the disconnect switch clearly to avoid accidental deactivation of the heater during freezing temperatures. Exposed chilled water piping also requires protection.

For additional protection, at least one of the following procedures should be used during periods of sub-freezing temperatures:

1. Adding of a concentration of a glycol anti-freeze with a freeze point 10 degrees F below the lowest expected temperature. This will result in decreased capacity and increased pressure drop.

   Note: Do not use automotive grade antifreezes as they contain inhibitors harmful to chilled water systems. Use only glycols specifically designated for use in building cooling systems.

2. Draining the water from outdoor equipment and piping and blowing the chiller tubes dry from the chiller. Do <u>not</u> energize the chiller heater when water is drained from the vessel.

   ⚠ CAUTION

   If fluid is absent from the evaporator, the evaporator heater must be de-energized to avoid burning out the heater and causing damage from the high temperatures.

1. Providing operation of the chilled water pump, circulating water through the chilled water system and through the evaporator.

Table 12, Freeze Protection

Temperature °F (°C)	Percent Volume Glycol Concentration Required			
	For Freeze Protection		For Burst Protection	
	Ethylene Glycol	Propylene Glycol	Ethylene Glycol	Propylene Glycol
20 (6.7)	16	18	11	12
10 (-12.2)	25	29	17	20
0 (-17.8)	33	36	22	24
-10 (-23.3)	39	42	26	28
-20 (-28.9)	44	46	30	30
-30 (-34.4)	48	50	30	33
-40 (-40.0)	52	54	30	35
-50 (-45.6)	56	57	30	35
-60 (-51.1)	60	60	30	35

Notes:
1. These figures are examples only and cannot be appropriate to every situation. Generally, for an extended margin of protection, select a temperature at least 15°F lower than the expected lowest ambient temperature. Inhibitor levels should be adjusted for solutions less than 25% glycol.
2. Glycol of less than 25% concentration is not recommended because of the potential for bacterial growth and loss of heat transfer efficiency.

Operating Limits:

Maximum standby ambient temperature, 130°F (55°C)

Maximum operating ambient temperature, see below

Minimum operating ambient temperature (standard), 35°F (2°C)

Minimum operating ambient temperature (optional low-ambient control), 0°F (-18°C)

Leaving chilled water temperature, 40°F to 60°F (4°C to 16°C)

Leaving chilled fluid range (with anti-freeze), 20°F to 60°F (-7°C to 16°C). Unloading is not permitted with fluid leaving temperatures below 30°F (-1°C).

Operating Delta-T range, 6 degrees F to 16 degrees F (10.8 C to 28.8 C)

Maximum operating inlet fluid temperature, 76°F (24°C)

Maximum startup inlet fluid temperature, 90°F (32°C)

Maximum non-operating inlet fluid temperature, 100°F (38°C)

NOTE: Contact the local McQuay sales office for operation outside any of these limits.

Maximum Operating Ambient Temperatures

Standard Efficiency, designated by a "0" as the last digit in the model number (such as AGS 170C) are designed for operation up to 125 degrees. Significant unloading above 115 degrees can occur depending on a variety of factors. Contact your sales representative for performance above 115 degrees. Additional unloading can result with leaving water temperatures above 45 degrees.

High Efficiency, designated by a "5" as the last digit in the model number (such as AGS 175C) are designed for operation up to 125 degrees without unloading for leaving water temperatures between 40 and 45 degrees Fahrenheit. Contact your sales representative for evaporator duty outside of this range. The High Efficiency models have larger components, and/or more fans than the comparable Standard Efficiency models. This results in improved efficiency and the ability to operate at higher ambient air temperatures.

High Ambient Option, A factory-installed option that provides components allowing operation in high ambient temperature locations. It can be applied to any unit and is mandatory on:

1. All units with the optional VFD low ambient control.
2. All units that can have operating ambient temperatures above 115°F (46°C).

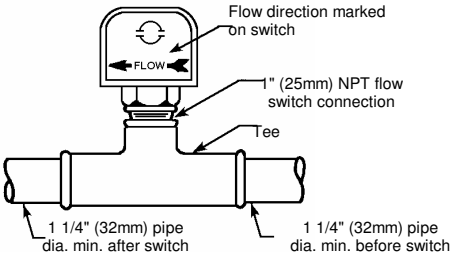
Flow Switch

A flow switch must be included in the chilled water system to prove that there is adequate water flow to the evaporator before the unit can start. It also serves to shut down the unit in the event that water flow is interrupted in order to guard against evaporator freeze-up.

A solid state flow switch that is factory-mounted and wired in the chiller leaving water nozzle is available as an option.

A flow switch for field mounting and wiring in the leaving chilled water is also available as an option from McQuay under

Figure 17, Flow Switch



ordering number 017503300. It is a paddle-type switch and adaptable to any pipe size from 1" (25mm) to 8" (203mm) nominal.

Certain minimum flow rates are required to close the switch and are listed in Table 13. Installation should be as shown in Figure 18.

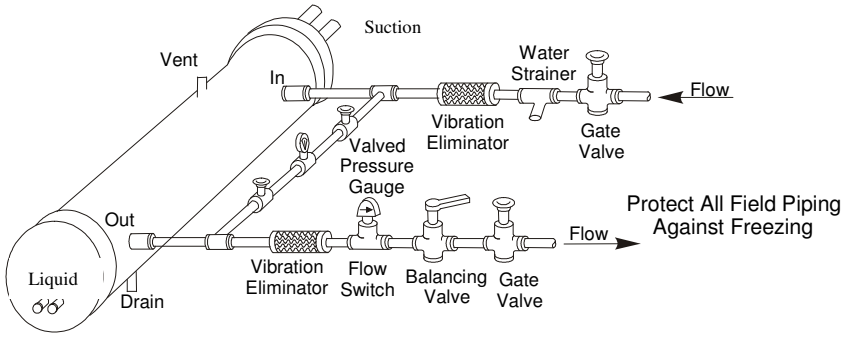
Electrical connections in the unit control center should be made at terminals 60 and 67 from switch terminals Y and R. The normally open contacts of the flow switch should be wired between these two terminals. Flow switch contact quality must be suitable for 24 VAC, low current (16ma). Flow switch wire must be in separate conduit from any high voltage conductors (115 VAC and higher) and have an insulation rating of 600 volts.

Table 13, Flow Switch Flow Rates

Pipe Size (NOTE !)		inch	1 1/4	1 1/2	2	2 1/2	3	4	5	6	8
		mm	32 (2)	38 (2)	51	63 (3)	76	102 (4)	127 (4)	153 (4)	204 (5)
Min. Adjst.	Flow	gpm	5.8	7.5	13.7	18.0	27.5	65.0	125.0	190.0	205.0
		Lpm	1.3	1.7	3.1	4.1	6.2	14.8	28.4	43.2	46.6
	No Flow	gpm	3.7	5.0	9.5	12.5	19.0	50.0	101.0	158.0	170.0
		Lpm	0.8	1.1	2.2	2.8	4.3	11.4	22.9	35.9	38.6
Max. Adjst.	Flow	gpm	13.3	19.2	29.0	34.5	53.0	128.0	245.0	375.0	415.0
		Lpm	3.0	4.4	6.6	7.8	12.0	29.1	55.6	85.2	94.3
	No Flow	gpm	12.5	18.0	27.0	32.0	50.0	122.0	235.0	360.0	400.0
		Lpm	2.8	4.1	6.1	7.3	11.4	27.7	53.4	81.8	90.8

NOTES:
1. A segmented 3-inch paddle (1, 2, and 3 inches) is furnished mounted, plus a 6-inch paddle loose.
2. Flow rates for a 2-inch paddle trimmed to fit the pipe.
3. Flow rates for a 3-inch paddle trimmed to fit the pipe.
4. Flow rates for a 3-inch paddle.
5. Flow rates for a 6-inch paddle.

Figure 18, Typical Field Water Piping



Notes:
1. Connections for vent and drain fittings are located on the top and bottom of the evaporator.
2. Piping must be supported to avoid putting strain on the evaporator nozzles.

Refrigerant Charge

All packaged units are designed for use with R-134a and are shipped with a full operating charge. The operating charge for each unit is shown in the Physical Data Tables beginning on page 26 for packaged units, and page 60 for remote evaporator models. Model AGS-CM/CB with remote evaporators are shipped with a full unit charge. Refrigerant must be added in the field for the evaporator and for the refrigerant lines.

Glycol Solutions

When using glycol anti-freeze solutions the chiller's capacity, glycol solution flow rate, and pressure drop through the evaporator can be calculated using the following formulas and tables.

Note: The procedure below does not specify the type of glycol. Use the derate factors found in Table 14 for corrections when using propylene glycol and those in Table 15 for ethylene glycol.

1. **Capacity** - Cooling capacity is reduced from that with plain water. To find the reduced value, multiply the chiller's water system tonnage by the capacity correction factor to find the chiller's capacity when using glycol.
2. **Flow** - To determine flow (or Delta-T) knowing Delta-T (or flow) and capacity:

$$GPM = \frac{(24)(tons)(flow\ factor)}{Delta - T}$$

3. **Pressure drop** - To determine pressure drop through the evaporator when using glycol, enter the water pressure drop curve at the water flow rate. Multiply the water pressure drop found there by the "PD" factor to obtain corrected glycol pressure drop.
4. **Power** - To determine glycol system kW, multiply the water system kW by the factor designated "Power".

Test coolant with a clean, accurate glycol solution hydrometer (similar to that found in service stations) to determine the freezing point. Obtain percent glycol from the freezing point table below. On glycol applications, the supplier normally recommends that a minimum of 25% solution by weight be used for protection against corrosion or that additional inhibitors should be employed.

NOTE: Do not use automotive grade antifreeze. Industrial grade glycols must be used. Automotive antifreeze contains inhibitors that will cause plating on the copper tubes within the chiller evaporator. The type and handling of glycol used must be consistent with local codes.

Table 14, Ethylene Glycol Factors

% E.G.	Freeze Point		Capacity	Power	Flow	PD
	°F	°C				
10	26	-3.3	0.996	0.998	1.036	1.097
20	18	-7.8	0.988	0.994	1.061	1.219
30	7	-13.9	0.979	0.991	1.092	1.352
40	-7	-21.7	0.969	0.986	1.132	1.532
50	-28	-33.3	0.958	0.981	1.182	1.748

Table 15, Propylene Glycol Factors

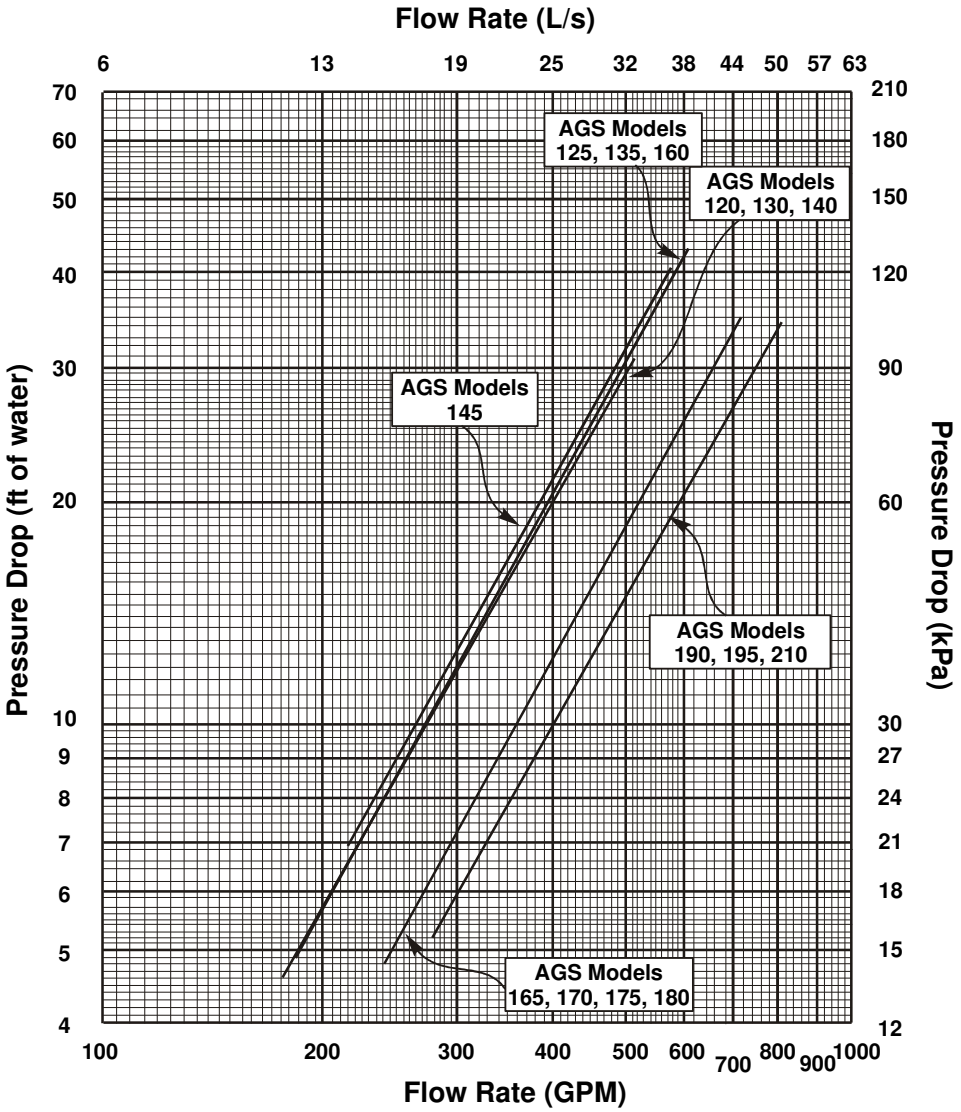
% P.G.	Freeze Point		Capacity	Power	Flow	PD
	°F	°C				
10	26	-3.3	0.991	0.996	1.016	1.092
20	19	-7.2	0.981	0.991	1.032	1.195
30	9	-12.8	0.966	0.985	1.056	1.345
40	-5	-20.6	0.947	0.977	1.092	1.544
50	-27	-32.8	0.932	0.969	1.140	1.906

Water Flow and Pressure Drop

Adjust the chilled water flow through the evaporator to meet specified conditions. The flow rates must fall between the minimum and maximum values shown in the table on the following page. Flow rates below the minimum values shown will result in laminar flow that will reduce efficiency, cause erratic operation of the electronic expansion valve and could cause low temperature cutouts. On the other hand, flow rates exceeding the maximum values shown can cause erosion on the evaporator water connections and tubes.

Measure the chilled water pressure drop through the evaporator at field-installed pressure taps. It is important not to include valve or strainer pressure drops in these readings.

Figure 19, Evaporator Pressure Drops



Minimum/Nominal/Maximum Flow Rates

AGS MODEL	MINIMUM FLOW				NOMINAL FLOW				MAXIMUM FLOW			
	gpm	l/s	ft	kpa	gpm	l/s	ft	kpa	gpm	l/s	ft	kpa
120	175	11.1	4.6	13.7	280	17.7	10.6	31.6	467	29.5	26.5	79.1
125	182	11.5	4.9	14.6	292	18.5	11.8	35.2	486	30.8	29.2	87.2
130	188	11.9	5.3	15.8	300	19.0	12.9	38.5	501	31.7	30.4	90.7
135	196	12.4	5.6	16.7	314	19.9	13.5	40.3	524	33.1	33.5	100.0
140	201	12.7	5.9	17.6	321	20.3	13.6	40.6	535	33.8	30.4	90.7
145	215	13.6	6.9	20.6	343	21.7	16.1	48.0	572	36.2	40.2	119.9
160	227	14.4	7.2	21.5	363	23.0	17.1	51.0	606	38.3	43.0	128.4
165	241	15.2	4.8	14.4	385	24.4	11.3	33.8	642	40.6	28.6	85.3
170	252	16.0	5.2	15.7	403	25.5	12.3	36.7	672	42.6	31.1	92.7
175	259	16.4	5.7	17.0	414	26.2	12.9	38.5	690	43.7	32.6	97.2
180	269	17.1	5.9	17.7	431	27.3	13.9	41.4	718	45.5	35.0	104.5
190	278	17.6	5.2	15.5	445	28.2	12.3	36.7	742	47.0	30.7	91.6
195	285	18.1	5.4	16.1	457	28.9	12.8	38.2	761	48.2	32.6	97.3
210	302	19.1	5.9	17.6	483	30.6	14.3	42.7	805	50.9	34.5	103.0

Physical Data, Standard Efficiency

Table 16, Physical Data, AGS 120C – AGS 140C

DATA	AGS MODEL NUMBER					
	120C		130C		140C	
	Ckt 1	Ckt 2	Ckt 1	Ckt 2	Ckt 1	Ckt 2
BASIC DATA						
Unit Cap. @ 44°F LWT, 95°F Ambient Temperature kW, (tons)	116.7 (410)		125.2 (440)		133.7 (470)	
Unit Operating Charge lbs (kg)	131 (59)	131 (59)	131 (59)	131 (59)	131 (59)	131 (59)
Cabinet Dimensions L x W x H, in. (mm)	187 x 89 x 101 4750 x 2261 x 2565		187 x 89 x 101 4750 x 2261 x 2565		187 x 89 x 101 4750 x 2261 x 2565	
Unit Operating Weight, lbs. (kg)	9452 (4291)		9452 (4291)		9452 (4291)	
Unit Shipping Weight, lbs (kg)	9020 (4095)		9020 (4095)		9020 (4095)	
Economizer	No		No		No	
COMPRESSORS, SCREW, SEMI-HERMETIC						
Nominal Capacity, tons (kW)	60 (211)	60 (211)	60 (211)	70 (246)	70 (246)	70 (246)
CONDENSERS, HIGH EFFICIENCY FIN AND TUBE TYPE WITH INTEGRAL SUBCOOLER						
Pumpdown Capacity, lbs (kg)	358 (163)	358 (163)	358 (163)	358 (163)	358 (163)	358 (163)
CONDENSER FANS, DIRECT DRIVE PROPELLER TYPE						
No. of Fans – 30 in. Fan Dia.	8		8		8	
No. of Motors -- hp (kW)	8 2 (1.5)		8 2 (1.5)		8 2 (1.5)	
Fan & Motor RPM, 60Hz	1140		1140		1140	
60 Hz Fan Tip Speed, fpm (m/s)	8950 (4224)		8950 (4224)		8950 (4224)	
60 Hz Total Unit Airflow, cfm (l/s)	86900 (41020)		86900 (41020)		86900 (41020)	
EVAPORATOR, DIRECT EXPANSION SHELL AND TUBE						
Shell Dia.-Tube Length in.(mm) - in. (mm)	15.5 x 82.4 (394 x 2093)		15.5 x 82.4 (394 x 2093)		15.5 x 82.4 (394 x 2093)	
Evaporator R-134a Charge lbs (kg)	1.95 (0.9)	1.95 (0.9)	1.95 (0.9)	1.95 (0.9)	1.95 (0.9)	1.95 (0.9)
Water Volume, gallons (liters)	49 (185)		49 (185)		49 (185)	
Max. Water Pressure, psi (kPa)	152 (1048)		152 (1048)		152 (1048)	
Max. Refrigerant Press., psi (kPa)	352 (2427)		352 (2427)		352 (2427)	

Table 17, Physical Data, AGS 160C – AGS 180C

DATA	AGS MODEL NUMBER					
	160C		170C		180C	
	Ckt. 1	Ckt. 2	Ckt. 1	Ckt. 2	Ckt. 1	Ckt. 2
BASIC DATA						
Unit Cap. @ 44°F LWT, 95°F Ambient Temperature kW, (tons)	151.4 (532)		168.1 (591)		179.6 (631)	
Unit Operating Charge, lbs (kg)	131 (59)	131 (59)	159 (72)	159 (72)	171 (78)	171 (78)
Cabinet Dim., L x W x H, in. (mm)	187 x 89 x 101 4750 x 2261 x 2565		225 x 89 x 101 5715 x 2261 x 2565		225 x 89 x 101 5715 x 2261 x 2565	
Unit Operating Weight, lbs. (kg)	10209 (4635)		11277 (5120)		11277 (5120)	
Unit Shipping Weight, lbs (kg)	9484 (4306)		10552 (4791)		10552 (4791)	
Economizer	No		No		Yes	
COMPRESSORS, SCREW, SEMI-HERMETIC						
Nominal Capacity, tons (kW)	70 (246)	85 (299)	85 (299)	85 (299)	95 (334)	95 (334)
CONDENSERS, HIGH EFFICIENCY FIN AND TUBE TYPE WITH INTEGRAL SUBCOOLER						
Pumpdown Capacity, lbs (kg)	358 (163)	358 (163)	399 (181)	399 (181)	399 (181)	399 (181)
CONDENSER FANS, DIRECT DRIVE PROPELLER TYPE						
No. of Fans; 30 in. Fan Dia.,	8		10		10	
No. of Motors – hp (kW)	8 2 (1.5)		10 2 (1.5)		10 2 (1.5)	
Fan & Motor RPM, 60Hz	1140		1140		1140	
60 Hz Fan Tip Speed, fpm	8950 (4224)		8950 (4224)		8950 (4224)	
60 Hz Total Unit Airflow, cfm (l/s)	86900 (41020)		108630 (51280)		108630 (51280)	
EVAPORATOR, DIRECT EXPANSION SHELL AND TUBE						
Shell Dia.,Tube Length in.(mm)	19.4 x 82.4 (493 x 2093)		19.4 x 105.1 (493 x 2670)		19.4 x 105.1 (493 x 2670)	
Evaporator R-134a Charge lbs (kg)	2.53 (1.1)	2.53 (1.1)	3.16 (1.4)	3.16 (1.4)	3.16 (1.4)	3.16 (1.4)
Water Volume, gallons (liters)	83 (314)		106 (401)		106 (401)	
Max. Water Pressure, psi (kPa)	152 (1048)		152 (1048)		152 (1048)	
Max. Refrigerant Press., psi (kPa)	352 (2427)		352 (2427)		352 (2427)	

Table 18, Physical Data, AGS 190C – AGS 210C

DATA	AGS 190C		AGS 210C	
	Ckt 1	Ckt 2	Ckt 1	Ckt 2
BASIC DATA				
Unit Cap. @ 44°F LWT, 95°F Ambient Temperature kW, (tons)	185.6 (653)		201.2 (707)	
Unit Operating Charge lbs (kg)	172 (78)	172 (78)	201 (91)	201 (91)
Cabinet Dimensions L x W x H, in. (mm)	225 x 89 x 101 5715 x 2261 x 2565		263 x 89 x 101 6680 x 2261 x 2565	
Unit Operating Weight, lbs. (kg)	11277 (5120)		11928 (5415)	
Unit Shipping Weight, lbs (kg)	10552 (4791)		11011 (4999)	
Economizer	Yes		Yes	
COMPRESSORS, SCREW, SEMI-HERMETIC				
Nominal Capacity, tons (kW)	95 (334)	95 (334)	95 (334)	95 (334)
CONDENSERS, HIGH EFFICIENCY FIN AND TUBE TYPE WITH INTEGRAL SUBCOOLER				
Pumpdown Capacity, lbs (kg)	399 (181)	399 (181)	438 (199)	438 (199)
CONDENSER FANS, DIRECT DRIVE PROPELLER TYPE				
No. of Fans -- 30 in. Fan Dia.,	10		12	
No. of Motors -- hp (kW)	10 2 (1.5)		12 2.5 (1.9)	
Fan & Motor RPM, 60Hz	1140		1140	
60 Hz Fan Tip Speed, fpm (m/s)	8950 (4224)		8950 (4224)	
60 Hz Total Unit Airflow, cfm (l/s)	108630 (51280)		130360 (61530)	
EVAPORATOR, DIRECT EXPANSION SHELL AND TUBE				
Shell Dia.-Tube Length in.(mm) - in. (mm)	19.4 x 105.1 (493 x 2670)		19.4 x 105.1 (493 x 2670)	
Evaporator R-134a Charge lbs (kg)	3.63 (1.6)	3.63 (1.6)	3.63 (1.6)	3.63 (1.6)
Water Volume, gallons (liters)	106 (401)		104 (392)	
Max. Water Pressure, psi (kPa)	152 (1048)		152 (1048)	
Max. Refrigerant Press., psi (kPa)	352 (2427)		352 (2427)	

Physical Data, High Efficiency

Table 19, Physical Data, AGS 125C – AGS 145C

DATA	AGS MODEL NUMBER					
	125C		135C		145C	
	Ckt 1	Ckt 2	Ckt 1	Ckt 2	Ckt 1	Ckt 2
BASIC DATA						
Unit Cap. @ 44°F LWT, 95°F Ambient Temperature kW, (tons)	121.6 (428)		130.9 (460)		143.0 (503)	
Unit Operating Charge lbs (kg)	159 (72)	159 (72)	159 (72)	159 (72)	159 (72)	159 (72)
Cabinet Dimensions L x W x H, in. (mm)	225 x 89 x 101 5715 x 2261 x 2565		225 x 89 x 101 5715 x 2261 x 2565		225 x 89 x 101 5715 x 2261 x 2565	
Unit Operating Weight, lbs. (kg)	10930 (4962)		10930 (4962)		10485 (4760)	
Unit Shipping Weight, lbs (kg)	10205 (4633)		10205 (4633)		9942 (4514)	
Economizer	No		No		No	
COMPRESSORS, SCREW, SEMI-HERMETIC						
Nominal Capacity, tons (kW)	60 (211)	60 (211)	60 (211)	70 (246)	70 (246)	70 (246)
CONDENSERS, HIGH EFFICIENCY FIN AND TUBE TYPE WITH INTEGRAL SUBCOOLER						
Pumpdown Capacity, lbs (kg)	399 (181)	399 (181)	399 (181)	399 (181)	399 (181)	399 (181)
CONDENSER FANS, DIRECT DRIVE PROPELLER TYPE						
No. of Fans – 30 in. Fan Dia.,	10, 30 (762)		10, 30 (762)		10, 30 (762)	
No. of Motors -- hp (kW)	10 2 (1.5)		10 2 (1.5)		10 2 (1.5)	
Fan & Motor RPM, 60Hz	1140		1140		1140	
60 Hz Fan Tip Speed, fpm (m/s)	8950 (4224)		8950 (4224)		8950 (4224)	
60 Hz Total Unit Airflow, cfm (l/s)	108630 (51280)		108630 (51280)		108630 (51280)	
EVAPORATOR, DIRECT EXPANSION SHELL AND TUBE						
Shell Dia.-Tube Length in.(mm) - in. (mm)	19.4 x 82.4 (493 x 2093)		19.4 x 82.4 (493 x 2093)		19.4 x 105.1 (493 x 2670)	
Evaporator R-134a Charge lbs (kg)	2.53 (1.1)	2.53 (1.1)	2.53 (1.1)	2.53 (1.1)	2.44 (1.1)	2.44 (1.1)
Water Volume, gallons (liters)	83 (314)		83 (314)		62 (236)	
Max. Water Pressure, psi (kPa)	152 (1048)		152 (1048)		152 (1048)	
Max. Refrigerant Press., psi (kPa)	352 (2427)		352 (2427)		352 (2427)	

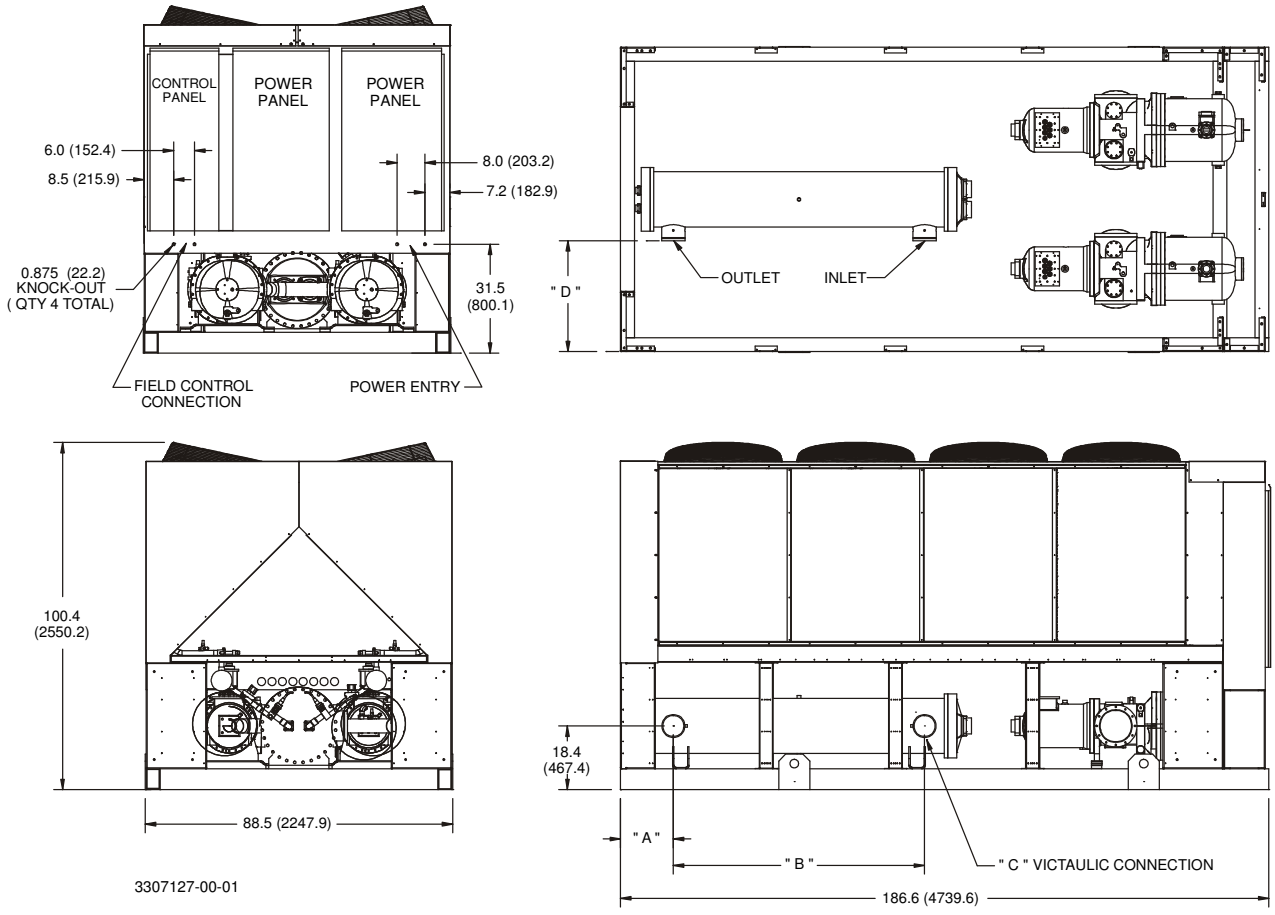
Table 20, Physical Data, AGS 165C – AGS 195C

DATA	AGS MODEL NUMBER					
	165C		175C		195C	
	Ckt 1	Ckt 2	Ckt 1	Ckt 2	Ckt 1	Ckt 2
BASIC DATA						
Unit Cap. @ 44°F LWT, 95°F Ambient Temperature kW, (tons)	160.5 (564)		172.5 (607)		190.3 (669)	
Unit Operating Charge lbs (kg)	186 (84)	186 (84)	186 (84)	186 (84)	201 (91)	201 (91)
Cabinet Dimensions L x W x H, in. (mm)	263 x 89 x 101 6680 x 2261 x 2565		263 x 89 x 101 6680 x 2261 x 2565		263 x 89 x 101 6680 x 2261 x 2565	
Unit Operating Weight, lbs. (kg)	11928 (5415)		11277 (5120)		11277 (5120)	
Unit Shipping Weight, lbs (kg)	11011 (4999)		11011 (4999)		11011 (4999)	
Economizer	N0		N0		Yes	
COMPRESSORS, SCREW, SEMI-HERMETIC						
Nominal Capacity, tons (kW)	70 (246)	85 (299)	85 (299)	85 (299)	95 (334)	95 (334)
CONDENSERS, HIGH EFFICIENCY FIN AND TUBE TYPE WITH INTEGRAL SUBCOOLER						
Pumpdown Capacity, lbs (kg)	438 (199)	438 (199)	438 (199)	438 (199)	438 (199)	438 (199)
CONDENSER FANS, DIRECT DRIVE PROPELLER TYPE						
No. of Fans – 30 in. Fan Dia.	12		12		12	
No. of Motors -- hp (kW)	12 2 (1.5)		12 2 (1.5)		12 2 (1.5)	
Fan & Motor RPM, 60Hz	1140		1140		1140	
60 Hz Fan Tip Speed, fpm (m/s)	8950 (4224)		8950 (4224)		8950 (4224)	
60 Hz Total Unit Airflow, cfm (l/s)	130360 (61530)		130360 (61530)		130360 (61530)	
EVAPORATOR, DIRECT EXPANSION SHELL AND TUBE						
Shell Dia.-Tube Length in.(mm) - in. (mm)	19.4 x 105.1 (493 x 2670)		19.4 x 105.1 (493 x 2670)		19.4 x 105.1 (493 x 2670)	
Evaporator R-134a Charge lbs (kg)	3.16 (1.4)	3.16 (1.4)	3.16 (1.4)	3.16 (1.4)	3.16 (1.4)	3.16 (1.4)
Water Volume, gallons (liters)	106 (401)		106 (401)		106 (401)	
Max. Water Pressure, psi (kPa)	152 (1048)		152 (1048)		152 (1048)	
Max. Refrigerant Press., psi (kPa)	352 (2427)		352 (2427)		352 (2427)	

Dimensional Data

Figure 20, Dimensions, AGS 120CS/H – AGS 160CS/H

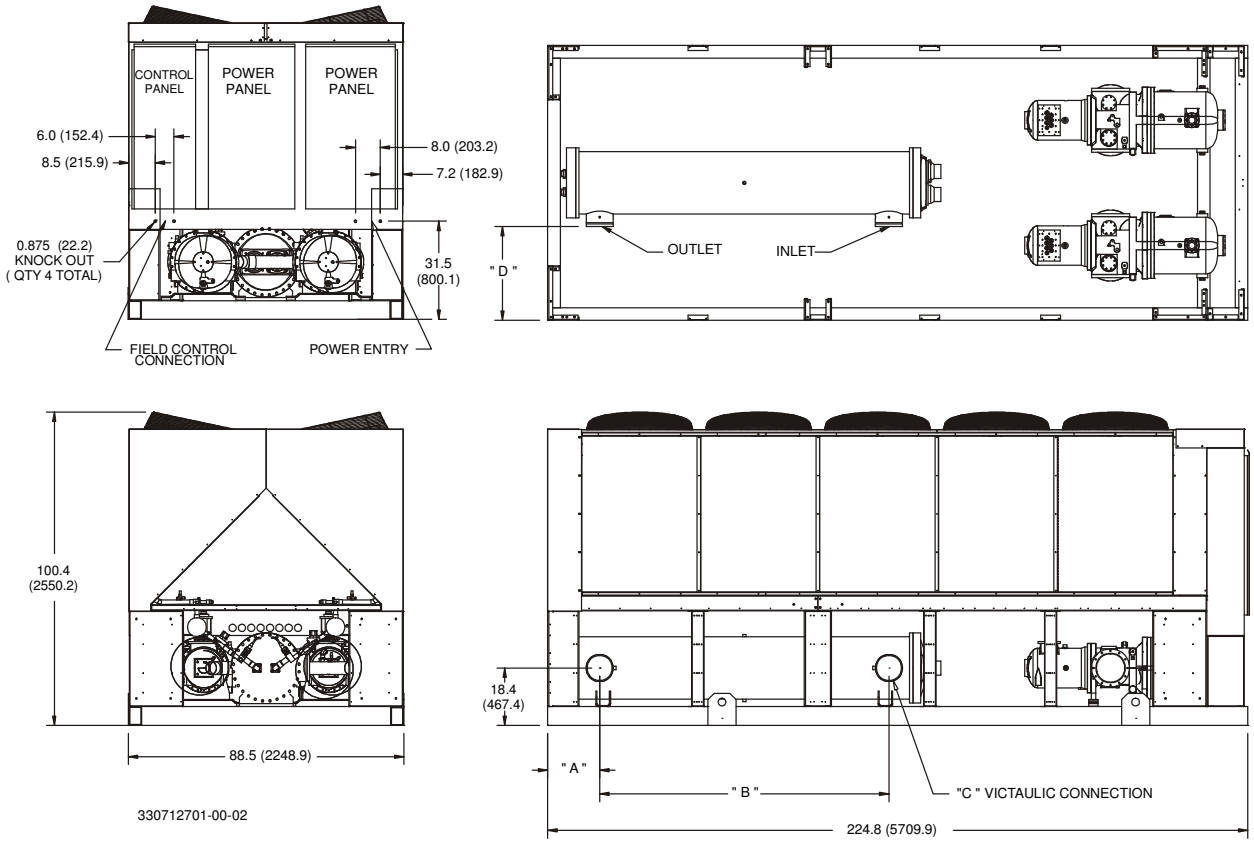
Note: See page 13 for lifting locations, mounting locations, weights and mounting loads.



UNIT SIZE	Dimensions In (mm)			
	" A "	" B "	" C "	" D "
AGS120C	15.2 (386.1)	72.3 (1836.4)	6 (152.4)	32.1 (815.3)
AGS130C	15.2 (386.1)	72.3 (1836.4)	6 (152.4)	32.1 (815.3)
AGS140C	15.2 (386.1)	72.3 (1836.4)	6 (152.4)	32.1 (815.3)
AGS160C	16.2 (411.5)	70.3 (1785.6)	8 (203.2)	30.1 (764.5)

Figure 21, Dimensions, AGS 125CS/H –190CS/H

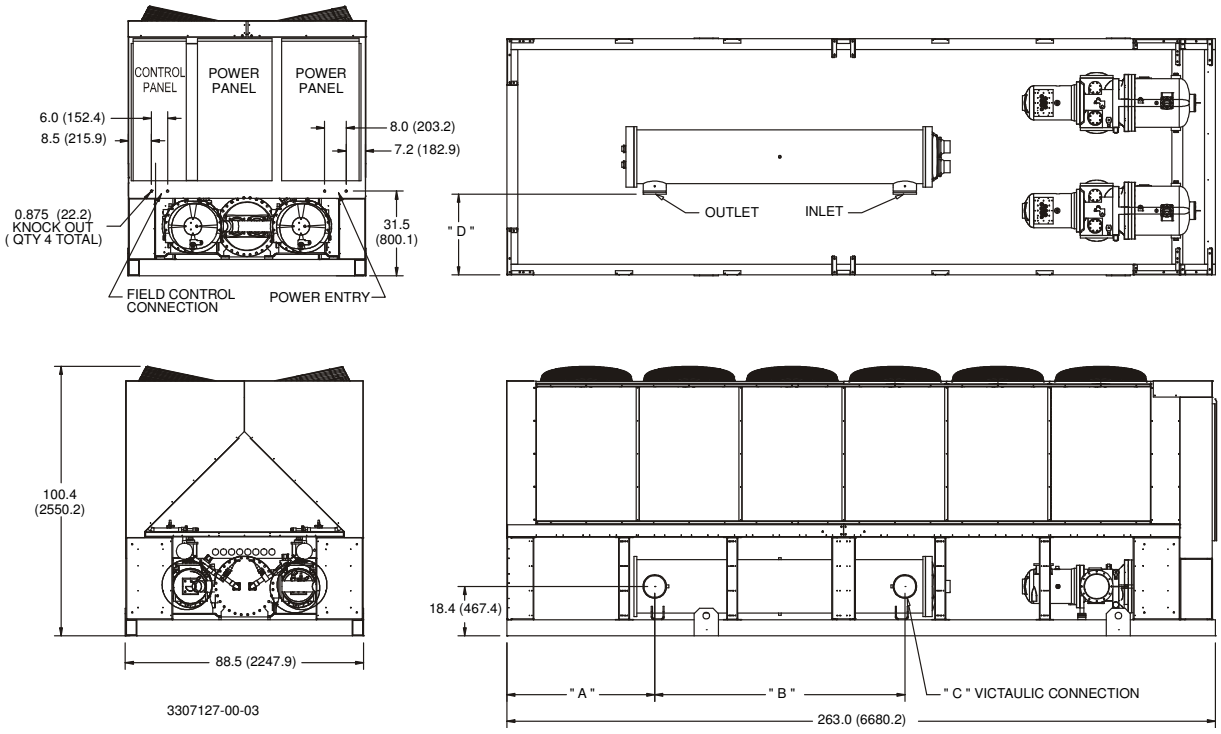
Note: See page13 for lifting locations, mounting locations, weights and mounting loads.



UNIT SIZE	Dimensions In (mm)			
	" A "	" B "	" C "	" D "
AGS125C	39.3 (998.2)	70.3 (1785.6)	8 (203.2)	30.1 (764.5)
AGS135C	39.3 (998.2)	70.3 (1785.6)	8 (203.2)	30.1 (764.5)
AGS145C	15.6 (396.2)	94.9 (2410.5)	6 (152.4)	32.1 (815.3)
AGS170C	16.7 (424.2)	92.9 (2359.7)	8 (203.2)	30.1 (764.5)
AGS180C	16.7 (424.2)	92.9 (2359.7)	8 (203.2)	30.1 (764.5)
AGS190C	16.7 (424.2)	92.9 (2359.7)	8 (203.2)	30.1 (764.5)

Figure 22 , Dimensions, AGS 165CS/H –210CS/H

Note: See page 13 for lifting locations, mounting locations, weights and mounting loads.



UNIT SIZE	Dimensions In (mm)			
	" A "	" B "	" C "	" D "
AGS165C	54.9 (1394.5)	92.9 (2359.7)	8 (203.2)	30.1 (764.5)
AGS175C	54.9 (1394.5)	92.9 (2359.7)	8 (203.2)	30.1 (764.5)
AGS195C	54.9 (1394.5)	92.9 (2359.7)	8 (203.2)	30.1 (764.5)
AGS210C	54.9 (1394.5)	92.9 (2359.7)	8 (203.2)	30.1 (764.5)

Field Wiring

General

Wiring must comply with all applicable codes and ordinances. Warranty does not cover damage to the equipment caused by wiring not complying with specifications.

An open fuse indicates a short, ground, or overload. Before replacing a fuse or restarting a compressor or fan motor, the trouble must be found and corrected.

Copper wire is required for all power lead terminations at the unit, and copper must be used for all other wiring to the unit.

AGS units can be ordered with main power wiring for either multiple-point power (standard) or single-point connection (optional).

If the standard multiple-point power wiring is ordered, two separate power connections are made to power blocks (or optional circuit breaker disconnects) in power panel. See the dimension drawings beginning on page 29 for entry locations. Separate disconnects are required for each electrical circuit if the McQuay optional factory-mounted disconnects are not ordered.

If the optional single-point power connection is ordered, a single power connection is made to a power block (or optional circuit breaker disconnect) in the unit power panel. A separate disconnect is required if the McQuay optional factory-mounted disconnect is not ordered. Isolation circuit breakers for each circuit are included.

It can be desirable to have the unit evaporator heaters on a separate disconnect switch from the main unit power supply so that the unit power can be shut down without defeating the freeze protection provided by the evaporator heaters. See the field wiring diagram on page 42 for connection details.

The 115-volt control transformer is factory mounted and wired.

⚠ CAUTION

If a separate disconnect is used for the 115V supply to the unit, it must power the entire control circuit, not just the evaporator heaters. It must be clearly marked so that it is not accidentally shut off during cold seasons. Freeze damage to the evaporator could result. If the evaporator is drained for winter freeze protection, the heaters must be *de-energized* to prevent heater burnout.

⚠ CAUTION

AGS unit compressors are single-direction rotation compressors and can be damaged if rotated in the wrong direction. For this reason, proper phasing of electrical power is important. Electrical phasing must be A, B, C for electrical phases 1, 2 and 3 (A=L1, B=L2, C=L3) for single or multiple point wiring arrangements. The solid-state starters contain phase reversal protection. DO NOT ALTER THE WIRING TO THE STARTERS.

Table 21, AGS 120C – AGS 210C, Electrical Data, Single-Point

AGS UNIT SIZE	VOLTS	HZ	MINIMUM CIRCUIT AMPACITY (MCA)	POWER SUPPLY (NOTE 1) FIELD WIRE	FIELD FUSE SIZE or HACR BREAKER SIZE	
					RECOM-MENDED	MAXIMUM
120C	208	60	581	(2) 350 MCM	700	800
	230		526	(2) 300 MCM	600	700
	380		320	400 MCM	400	400
	460		279	300 MCM	350	350
	575		211	4/0 AWG	250	250
125C	208	60	595	(2) 350 MCM	700	800
	230		539	(2) 300 MCM	600	700
	380		328	400 MCM	400	450
	460		285	300 MCM	350	350
	575		216	4/0 AWG	250	300
130C	208	60	625	(2) 300 MCM	700	800
	230		563	(2) 300 MCM	700	800
	380		342	400 MCM	400	450
	460		291	350 MCM	350	400
	575		222	4/0 AWG	250	300
135C	208	60	639	(2) 400 MCM	800	800
	230		576	(2) 350 MCM	700	800
	380		350	400 MCM	400	450
	460		298	350 MCM	350	400
	575		227	4/0 AWG	250	300
140C	208	60	660	(2) 400 MCM	800	800
	230		593	(2) 350 MCM	700	800
	380		359	2-250 MCM	400	500
	460		301	350 MCM	350	400
	575		231	250 MCM	300	300
145C	208*	60	674	(2) 400 MCM	800	800
	230		606	(2) 350 MCM	700	800
	380		367	2-250 MCM	450	500
	460		308	350 MCM	350	400
	575		236	250 MCM	300	300
160C	208*	60	716	(2) 2-250 MCM	800	1000
	230		646	(2) 400 MCM	800	800
	380		400	2-250 MCM	450	500
	460		325	400 MCM	400	450
	575		255	250 MCM	300	350
165C	208*	60	745	(2) 2-250 MCM	1000	1000
	230		672	(2) 400 MCM	800	800
	380		416	2-300 MCM	500	500
	460		338	400 MCM	400	450
	575		265	300 MCM	300	350
170C	208*	60	775	(2) 2-250 MCM	1000	1000
	230		701	(2) 400 MCM	800	800
	380		441	2-300 MCM	500	600
	460		351	400 MCM	400	450
	575		279	300 MCM	350	350
175C	208*	60	790	(2) 2-250 MCM	1000	1000
	230		714	(2) 2-250 MCM	800	800
	380		449	2-300 MCM	500	600
	460		357	2-250 MCM	400	450
	575		284	300 MCM	350	350

Continued on next page.

AGS UNIT SIZE	VOLTS	HZ	MINIMUM CIRCUIT AMPACITY (MCA)	POWER SUPPLY (NOTE 1) FIELD WIRE	FIELD FUSE SIZE or HACR BREAKER SIZE	
					RECOM-MENDED	MAXIMUM
180C	208*	60	853	(2) 2-300 MCM	1000	1000
	230		772	(2) 2-250 MCM	1000	1000
	380		469	(2)-250 MCM	600	600
	460		380	2-250 MCM	450	500
	575		301	350 MCM	350	400
190C	208*	60	853	(2) 2-300 MCM	1000	1000
	230		772	(2) 2-250 MCM	1000	1000
	380		469	(2)-250 MCM	600	600
	460		380	2-250 MCM	450	500
	575		301	350 MCM	350	400
195C	208*	60	871	(2) 2-300 MCM	1000	1000
	230		788	(2) 2-250 MCM	1000	1000
	380		479	(2)-250 MCM	600	600
	460		387	2-250 MCM	450	500
	575		306	350 MCM	350	400
210C	208*	60	897	(2) 2-300 MCM	1000	1200
	230		812	(2) 2-250 MCM	1000	1000
	380		493	(2)-250 MCM	600	600
	460		396	2-250 MCM	450	500
	575		313	400 MCM	350	400

Notes
1. See Note 1 on page 47 for explanation of wiring nomenclature.
2. Table based on 75°C field wire.
3. A “HACR” breaker is a circuit breaker designed for use on equipment with multiple motors. It stands for Heating, Air Conditioning, Refrigeration.
4. Complete notes are on page 47.

Table 22, AGS 120C – AGS 210C, Electrical Data, Multiple-Point

AGS UNIT SIZE	VOLTS	HZ	ELECTRICAL CIRCUIT 1 (COMP 1)				ELECTRICAL CIRCUIT 2 (COMP 2)			
			MINIMUM CIRCUIT AMPS (MCA)	POWER SUPPLY	FIELD FUSING		MINIMUM CIRCUIT AMPS (MCA)	POWER SUPPLY	FIELD FUSING	
				FIELD WIRE	REC FUSE SIZE	MAX FUSE SIZE		FIELD WIRE	REC FUSE SIZE	MAX FUSE SIZE
120	208	60	320	400 MCM	400	500	320	400 MCM	400	500
	230		289	350 MCM	350	450	289	350 MCM	350	450
	380		176	3/0 AWG	225	300	176	3/0 AWG	225	300
	460		154	2/0 AWG	200	250	154	2/0 AWG	200	250
	575		116	1 AWG	150	200	116	1 AWG	150	200
125	208	60	327	400 MCM	400	500	327	400 MCM	400	500
	230		296	350 MCM	350	450	296	350 MCM	350	450
	380		180	3/0 AWG	225	300	180	3/0 AWG	225	300
	460		157	2/0 AWG	200	250	157	2/0 AWG	200	250
	575		119	1 AWG	150	200	119	1 AWG	150	200
130	208	60	320	400 MCM	400	500	363	2-250 MCM	450	600
	230		289	350 MCM	350	450	327	400 MCM	400	500
	380		176	3/0 AWG	225	300	198	3/0 AWG	250	300
	460		154	2/0 AWG	200	250	166	2/0 AWG	200	250
	575		116	1 AWG	150	200	128	1 AWG	175	200
135	208	60	327	400 MCM	400	500	371	2-250 MCM	450	600
	230		296	350 MCM	350	450	333	400 MCM	400	500
	380		180	3/0 AWG	225	300	202	4/0 AWG	250	300
	460		157	2/0 AWG	200	250	169	2/0 AWG	200	250
	575		119	1 AWG	150	200	130	1 AWG	175	200
140	208	60	363	2-250 MCM	450	600	363	2-250 MCM	450	600
	230		327	400 MCM	400	500	327	400 MCM	400	500
	380		198	3/0 AWG	250	300	198	3/0 AWG	250	300
	460		166	2/0 AWG	200	250	166	2/0 AWG	200	250
	575		128	1 AWG	175	200	128	1 AWG	175	200

Continued on next page.

AGS UNIT SIZE	VOLTS	HZ	ELECTRICAL CIRCUIT 1 (COMP 1)				ELECTRICAL CIRCUIT 2 (COMP 2)			
			MINIMUM CIRCUIT AMPS (MCA)	POWER SUPPLY	FIELD FUSING		MINIMUM CIRCUIT AMPS (MCA)	POWER SUPPLY	FIELD FUSING	
				FIELD WIRE	REC FUSE SIZE	MAX FUSE SIZE		FIELD WIRE	REC FUSE SIZE	MAX FUSE SIZE
145	208	60	371	2-250 MCM	450	600	371	2-250 MCM	450	600
	230		333	400 MCM	400	500	333	400 MCM	400	500
	380		202	4/0 AWG	250	300	202	4/0 AWG	250	300
	460		169	2/0 AWG	200	250	169	2/0 AWG	200	250
	575		130	1 AWG	175	200	130	1 AWG	175	200
160	208	60	363	2-250 MCM	450	600	420	2-300 MCM	500	700
	230		327	400 MCM	400	500	379	2-250 MCM	450	600
	380		198	3/0 AWG	250	300	239	250 MCM	300	400
	460		166	2/0 AWG	200	250	190	3/0 AWG	250	300
	575		128	1 AWG	175	200	151	2/0 AWG	200	250
165	208	60	378	2-250 MCM	450	600	434	2-300 MCM	450	600
	230		340	400 MCM	400	500	393	2-250 MCM	400	500
	380		206	4/0 AWG	250	350	247	250 MCM	250	350
	460		173	2/0 AWG	225	250	197	3/0 AWG	225	250
	575		132	1/0 AWG	175	225	156	2/0 AWG	175	225
170	208	60	427	2-300 MCM	600	700	427	2-300 MCM	600	700
	230		386	2-250 MCM	500	600	386	2-250 MCM	500	600
	380		243	250 MCM	300	400	243	250 MCM	300	400
	460		193	3/0 AWG	250	300	193	3/0 AWG	250	300
	575		154	2/0 AWG	200	250	154	2/0 AWG	200	250
175	208	60	434	2-300 MCM	600	700	434	2-300 MCM	600	700
	230		393	2-250 MCM	500	600	393	2-250 MCM	500	600
	380		247	250 MCM	300	400	247	250 MCM	300	400
	460		197	3/0 AWG	250	300	197	3/0 AWG	250	300
	575		156	2/0 AWG	200	250	156	2/0 AWG	200	250
180	208	60	469	(2) 250 MCM	600	800	469	(2) 250 MCM	600	800
	230		425	2-300 MCM	500	700	425	2-300 MCM	500	700
	380		258	300 MCM	350	400	258	300 MCM	350	400
	460		209	4/0 AWG	250	350	209	4/0 AWG	250	350
	575		166	2/0 AWG	200	250	166	2/0 AWG	200	250
190	208	60	469	(2) 250 MCM	600	800	469	(2) 250 MCM	600	800
	230		425	2-300 MCM	500	700	425	2-300 MCM	500	700
	380		258	300 MCM	350	400	258	300 MCM	350	400
	460		209	4/0 AWG	250	350	209	4/0 AWG	250	350
	575		166	2/0 AWG	200	250	166	2/0 AWG	200	250
195	208	60	478	(2) 250 MCM	600	800	478	(2) 250 MCM	600	800
	230		433	2-300 MCM	600	700	433	2-300 MCM	600	700
	380		263	300 MCM	350	400	263	300 MCM	350	400
	460		213	4/0 AWG	300	350	213	4/0 AWG	300	350
	575		169	2/0 AWG	200	250	169	2/0 AWG	200	250
210	208	60	491	(2) 250 MCM	600	800	491	(2) 250 MCM	600	800
	230		445	2-300 MCM	600	700	445	2-300 MCM	600	700
	380		270	300 MCM	350	450	270	300 MCM	350	450
	460		218	4/0 AWG	300	350	218	4/0 AWG	300	350
	575		172	2/0 AWG	225	250	172	2/0 AWG	225	250

Table 23, AGS 120C – AGS 210C, Compressor and Condenser Fan Motor Amp Draw

AGS UNIT SIZE	VOLTS	HZ	RATED LOAD AMPS		FAN MOTORS FLA (EACH)	NO OF FAN MOTORS	L R A FAN MOTORS (EACH)
			CIRCUIT #1	CIRCUIT #2			
120	208	60	232	232	7.3	8	40.0
	230		210	210	6.6	8	40.0
	380		128	128	4.0	8	20.0
	460		112	112	3.3	8	20.0
	575		85	85	2.4	8	12.8
125	208	60	232	232	7.3	10	40.0
	230		210	210	6.6	10	40.0
	380		128	128	4.0	10	20.0
	460		112	112	3.3	10	20.0
	575		85	85	2.4	10	12.8
130	208	60	232	267	7.3	8	40.0
	230		210	240	6.6	8	40.0
	380		128	145	4.0	8	20.0
	460		112	122	3.3	8	20.0
	575		85	94	2.4	8	12.8
135	208	60	232	267	7.3	10	40.0
	230		210	240	6.6	10	40.0
	380		128	145	4.0	10	20.0
	460		112	122	3.3	10	20.0
	575		85	94	2.4	10	12.8
140	208	60	267	267	7.3	8	40.0
	230		240	240	6.6	8	40.0
	380		145	145	4.0	8	20.0
	460		122	122	3.3	8	20.0
	575		94	94	2.4	8	12.8
145	208	60	267	267	7.3	10	40.0
	230		240	240	6.6	10	40.0
	380		145	145	4.0	10	20.0
	460		122	122	3.3	10	20.0
	575		94	94	2.4	10	12.8
160	208	60	267	312	7.3	8	40.0
	230		240	282	6.6	8	40.0
	380		145	178	4.0	8	20.0
	460		122	141	3.3	8	20.0
	575		94	113	2.4	8	12.8
165	208	60	267	312	7.3	12	40.0
	230		240	282	6.6	12	40.0
	380		145	178	4.0	12	20.0
	460		122	141	3.3	12	20.0
	575		94	113	2.4	12	12.8
170	208	60	312	312	7.3	10	40.0
	230		282	282	6.6	10	40.0
	380		178	178	4.0	10	20.0
	460		141	141	3.3	10	20.0
	575		113	113	2.4	10	12.8
175	208	60	312	312	7.3	12	40.0
	230		282	282	6.6	12	40.0
	380		178	178	4.0	12	20.0
	460		141	141	3.3	12	20.0
	575		113	113	2.4	12	12.8
180	208	60	340	340	7.3	10	40.0
	230		308	308	6.6	10	40.0
	380		187	187	4.0	10	20.0
	460		154	154	3.3	10	20.0
	575		123	123	2.4	10	12.8

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AGS UNIT SIZE	VOLTS	HZ	RATED LOAD AMPS		FAN MOTORS FLA (EACH)	NO OF FAN MOTORS	L R A FAN MOTORS (EACH)
			CIRCUIT #1	CIRCUIT #2			
190	208	60	340	340	7.3	10	40.0
	230		308	308	6.6	10	40.0
	380		187	187	4.0	10	20.0
	460		154	154	3.3	10	20.0
	575		123	123	2.4	10	12.8
195	208	60	340	340	7.3	12	40.0
	230		308	308	6.6	12	40.0
	380		187	187	4.0	12	20.0
	460		154	154	3.3	12	20.0
	575		123	123	2.4	12	12.8
210	208	60	340	340	11.0	12	46.0
	230		308	308	9.9	12	46.0
	380		187	187	6.0	12	25.0
	460		154	154	4.1	12	23.0
	575		123	123	3.0	12	20.0

NOTES:
1. Table based on 75°C field wire.
2. Complete notes are on page on page 47.

Table 24, AGS 120C – AGS 210C, Customer Wiring Information With Single-Point Power

AGS UNIT SIZE	VOLTS	HZ	WIRING TO STANDARD UNIT POWER BLOCK		WIRING TO OPTIONAL NONFUSED MOLDED CASE SWITCH IN UNIT	
			TERMINAL SIZE AMPS	CONNECTOR WIRE RANGE PER PHASE (COPPER WIRE ONLY)	SIZE	CONNECTOR WIRE RANGE PER PHASE (COPPER WIRE ONLY)
120	208	60	800	1/0 – 750 MCM (4/C)	800	1/0 – 500 MCM (3/C)
	230		800	1/0 – 750 MCM (4/C)	800	1/0 – 500 MCM (3/C)
	380		400	#6 – 350 MCM (2/c)	400	3/0 – 500 MCM (2/C)
	460		400	#6 – 350 MCM (2/c)	400	3/0 – 500 MCM (2/C)
	575		400	#6 – 350 MCM (2/c)	250	#6 – 350 MCM (1/C)
125	208	60	800	1/0 – 750 MCM (4/C)	800	1/0 – 500 MCM (3/C)
	230		800	1/0 – 750 MCM (4/C)	800	1/0 – 500 MCM (3/C)
	380		400	#6 – 350 MCM (2/C)	400	3/0 – 500 MCM (2/C)
	460		400	#6 – 350 MCM (2/C)	400	3/0 – 500 MCM (2/C)
	575		400	#6 – 350 MCM (2/C)	250	#6 – 350 MCM (1/C)
130	208	60	800	1/0 – 750 MCM (4/C)	800	1/0 – 500 MCM (3/C)
	230		800	1/0 – 750 MCM (4/C)	800	1/0 – 500 MCM (3/C)
	380		400	#6 – 350 MCM (2/C)	400	3/0 – 500 MCM (2/C)
	460		400	#6 – 350 MCM (2/C)	400	3/0 – 500 MCM (2/C)
	575		400	#6 – 350 MCM (2/C)	250	#6 – 350 MCM (1/C)
135	208	60	800	1/0 – 750 MCM (4/C)	800	1/0 – 500 MCM (3/C)
	230		800	1/0 – 750 MCM (4/C)	800	1/0 – 500 MCM (3/C)
	380		400	#6 – 350 MCM (2/C)	400	3/0 – 500 MCM (2/C)
	460		400	#6 – 350 MCM (2/C)	400	3/0 – 500 MCM (2/C)
	575		400	#6 – 350 MCM (2/C)	250	#6 – 350 MCM (1/C)
140	208	60	800	1/0 – 750 MCM (4/C)	800	1/0 – 500 MCM (3/C)
	230		800	1/0 – 750 MCM (4/C)	800	1/0 – 500 MCM (3/C)
	380		400	#6 – 350 MCM (2/C)	400	3/0 – 500 MCM (2/C)
	460		400	#6 – 350 MCM (2/C)	400	3/0 – 500 MCM (2/C)
	575		400	#6 – 350 MCM (2/C)	250	#6 – 350 MCM (1/C)
145	208	60	800	1/0 – 750 MCM (4/C)	800	1/0 – 500 MCM (3/C)
	230		800	1/0 – 750 MCM (4/C)	800	1/0 – 500 MCM (3/C)
	380		400	#6 – 350 MCM (2/C)	400	3/0 – 500 MCM (2/C)
	460		400	#6 – 350 MCM (2/C)	400	3/0 – 500 MCM (2/C)
	575		400	#6 – 350 MCM (2/C)	250	#6 – 350 MCM (1/C)

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AGS UNIT SIZE	VOLTS	HZ	WIRING TO STANDARD UNIT POWER BLOCK		WIRING TO OPTIONAL NONFUSED MOLDED CASE SWITCH IN UNIT	
			TERMINAL SIZE AMPS	CONNECTOR WIRE RANGE PER PHASE (COPPER WIRE ONLY)	SIZE AMPS	CONNECTOR WIRE RANGE PER PHASE (COPPER WIRE ONLY)
160	208	60	800	1/0 – 750 MCM (4/C)	800	1/0 – 500 MCM (3/C)
	230		800	1/0 – 750 MCM (4/C)	800	1/0 – 500 MCM (3/C)
	380		800	1/0 – 750 MCM (4/C)	600	3/0 – 500 MCM (2/C)
	460		400	#6 – 350 MCM (2/C)	600	3/0 – 500 MCM (2/C)
	575		400	#6 – 350 MCM (2/C)	600	3/0 – 500 MCM (2/C)
165	208	60	800	1/0 – 750 MCM (4/C)	800	1/0 – 500 MCM (3/C)
	230		800	1/0 – 750 MCM (4/C)	800	1/0 – 500 MCM (3/C)
	380		800	1/0 – 750 MCM (4/C)	600	3/0 – 500 MCM (2/C)
	460		400	#6 – 350 MCM (2/C)	600	3/0 – 500 MCM (2/C)
	575		400	#6 – 350 MCM (2/C)	600	3/0 – 500 MCM (2/C)
170	208	60	1000	1/0 – 750 MCM (4/C)	1200	250 – 500 MCM (4/C)
	230		800	1/0 – 750 MCM (4/C)	800	1/0 – 800 MCM (2/C)
	380		800	1/0 – 750 MCM (4/C)	600	3/0 – 500 MCM (2/C)
	460		400	#6 – 350 MCM (2/C)	600	3/0 – 500 MCM (2/C)
	575		400	#6 – 350 MCM (2/C)	400	3/0 – 500 MCM (2/C)
175	208	60	1000	1/0 – 750 MCM (4/C)	1200	250 – 500 MCM (4/C)
	230		800	1/0 – 750 MCM (4/C)	800	1/0 – 800 MCM (2/C)
	380		800	1/0 – 750 MCM (4/C)	600	3/0 – 500 MCM (2/C)
	460		400	#6 – 350 MCM (2/C)	600	3/0 – 500 MCM (2/C)
	575		400	#6 – 350 MCM (2/C)	400	3/0 – 500 MCM (2/C)
180	208	60	1000	1/0 – 750 MCM (4/C)	1200	250 – 500 MCM (4/C)
	230		1000	1/0 – 750 MCM (4/C)	1200	250 – 500 MCM (4/C)
	380		800	1/0 – 750 MCM (4/C)	600	3/0 – 500 MCM (2/C)
	460		400	#6 – 350 MCM (2/C)	600	3/0 – 500 MCM (2/C)
	575		400	#6 – 350 MCM (2/C)	400	3/0 – 500 MCM (2/C)
190	208	60	1000	1/0 – 750 MCM (4/C)	1200	250 – 500 MCM (4/C)
	230		1000	1/0 – 750 MCM (4/C)	1200	250 – 500 MCM (4/C)
	380		800	1/0 – 750 MCM (4/C)	600	3/0 – 500 MCM (2/C)
	460		400	#6 – 350 MCM (2/C)	600	3/0 – 500 MCM (2/C)
	575		400	#6 – 350 MCM (2/C)	400	3/0 – 500 MCM (2/C)
195	208	60	1000	1/0 – 750 MCM (4/C)	1200	250 – 500 MCM (4/C)
	230		1000	1/0 – 750 MCM (4/C)	1200	250 – 500 MCM (4/C)
	380		800	1/0 – 750 MCM (4/C)	600	3/0 – 500 MCM (2/C)
	460		400	#6 – 350 MCM (2/C)	600	3/0 – 500 MCM (2/C0
	575		400	#6 – 350 MCM (2/C)	400	3/0 – 500 MCM (2/C)
210	208	60	1000	1/0 – 750 MCM (4/C)	1200	250 – 500 MCM (4/C)
	230		1000	1/0 – 750 MCM (4/C)	1200	250 – 500 MCM (4/C)
	380		800	1/0 – 750 MCM (4/C)	600	3/0 – 500 MCM (2/C)
	460		400	#6 – 350 MCM (2/C)	600	3/0 – 500 MCM (2/C)
	575		400	#6 – 350 MCM (2/C)	400	3/0 – 500 MCM (2/C)

NOTE:

1. Terminal size amps are the maximum amps that the power block is rated for.
2. Complete notes are on page 47.
3. Data based on 75°C wire.
4. (2/C) notation means two cables per conduit.

Table 25, AGS 120C – 210C, Wiring Information with Multiple-Point Power w/o Disconnect

AGS UNIT SIZE	VOLTS	HZ	WIRING TO UNIT POWER BLOCK			
			TERMINAL SIZE (AMPS)		CONNECTOR WIRE RANGE PER PHASE (COPPER WIRE ONLY)	
			CKT 1	CKT 2	CKT 1	CKT 2
120	208	60	400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	230		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	380		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	460		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	575		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
125	208	60	400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	230		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	380		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	460		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	575		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
130	208	60	400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	230		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	380		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	460		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	575		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
135	208	60	400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	230		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	380		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	460		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	575		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
140	208	60	400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	230		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	380		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	460		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	575		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
145	208	60	400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	230		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	380		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	460		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	575		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
160	208	60	400	800	#6 – 350 MCM (2/C)	1/0 – 750 MCM (4/C)
	230		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	380		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	460		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	575		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
165	208	60	400	800	#6 – 350 MCM (2/C)	1/0 – 750 MCM (4/C)
	230		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	380		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	460		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	575		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
170	208	60	800	800	1/0 – 750 MCM (4/C)	1/0 – 750 MCM (4/C)
	230		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	380		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	460		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	575		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
175	208	60	800	800	1/0 – 750 MCM (4/C)	1/0 – 750 MCM (4/C)
	230		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	380		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	460		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	575		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
180	208	60	800	800	1/0 – 750 MCM (4/C)	1/0 – 750 MCM (4/C)
	230		800	800	1/0 – 750 MCM (4/C)	1/0 – 750 MCM (4/C)
	380		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	460		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	575		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)

Continued on next page

AGS UNIT SIZE	VOLTS	HZ	WIRING TO UNIT POWER BLOCK			
			TERMINAL SIZE (AMPS)		CONNECTOR WIRE RANGE PER PHASE (COPPER WIRE ONLY)	
			CKT 1	CKT 2	CKT 1	CKT 2
190	208	60	800	800	1/0 – 750 MCM (4/C)	1/0 – 750 MCM (4/C)
	230		800	800	1/0 – 750 MCM (4/C)	1/0 – 750 MCM (4/C)
	380		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	460		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	575		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
195	208	60	800	800	1/0 – 750 MCM (4/C)	1/0 – 750 MCM (4/C)
	230		800	800	1/0 – 750 MCM (4/C)	1/0 – 750 MCM (4/C)
	380		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	460		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	575		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
210	208	60	800	800	1/0 – 750 MCM (4/C)	1/0 – 750 MCM (4/C)
	230		800	800	1/0 – 750 MCM (4/C)	1/0 – 750 MCM (4/C)
	380		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	460		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)
	575		400	400	#6 – 350 MCM (2/C)	#6 – 350 MCM (2/C)

NOTES:
1. Terminal size amps are the maximum amps that the power block is rated for.
2. See Table 26 for multiple point with Disconnect Switch connections.
3. Data based on 75°C wire.
4. (2/C) notation means two cables per conduit.
5. Complete notes are on page 47.

Table 26, AGS 120C –210C, Wiring Data with Multiple-Point Power w/ Disconnect Switch

AGS UNIT SIZE	VOLTS	HZ	WIRING TO UNIT DISCONNECT SWITCH (MOLDED CASE SWITCH)			
			TERMINAL SIZE (AMPS)		CONNECTOR WIRE RANGE PER PHASE (COPPER WIRE ONLY)	
			CKT 1	CKT 2	CKT 1	CKT 2
120	208	60	400	400	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	230		400	400	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	380		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
	460		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
	575		150	150	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
125	208	60	400	400	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	230		400	400	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	380		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
	460		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
	575		150	150	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
130	208	60	400	400	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	230		400	400	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	380		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
	460		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
	575		150	150	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
135	208	60	400	400	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	230		400	400	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	380		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
	460		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
	575		150	150	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
140	208	60	400	400	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	230		400	400	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	380		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
	460		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
	575		150	150	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
145	208	60	400	400	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	230		400	400	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	380		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
	460		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
	575		150	150	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)

Continued on next page

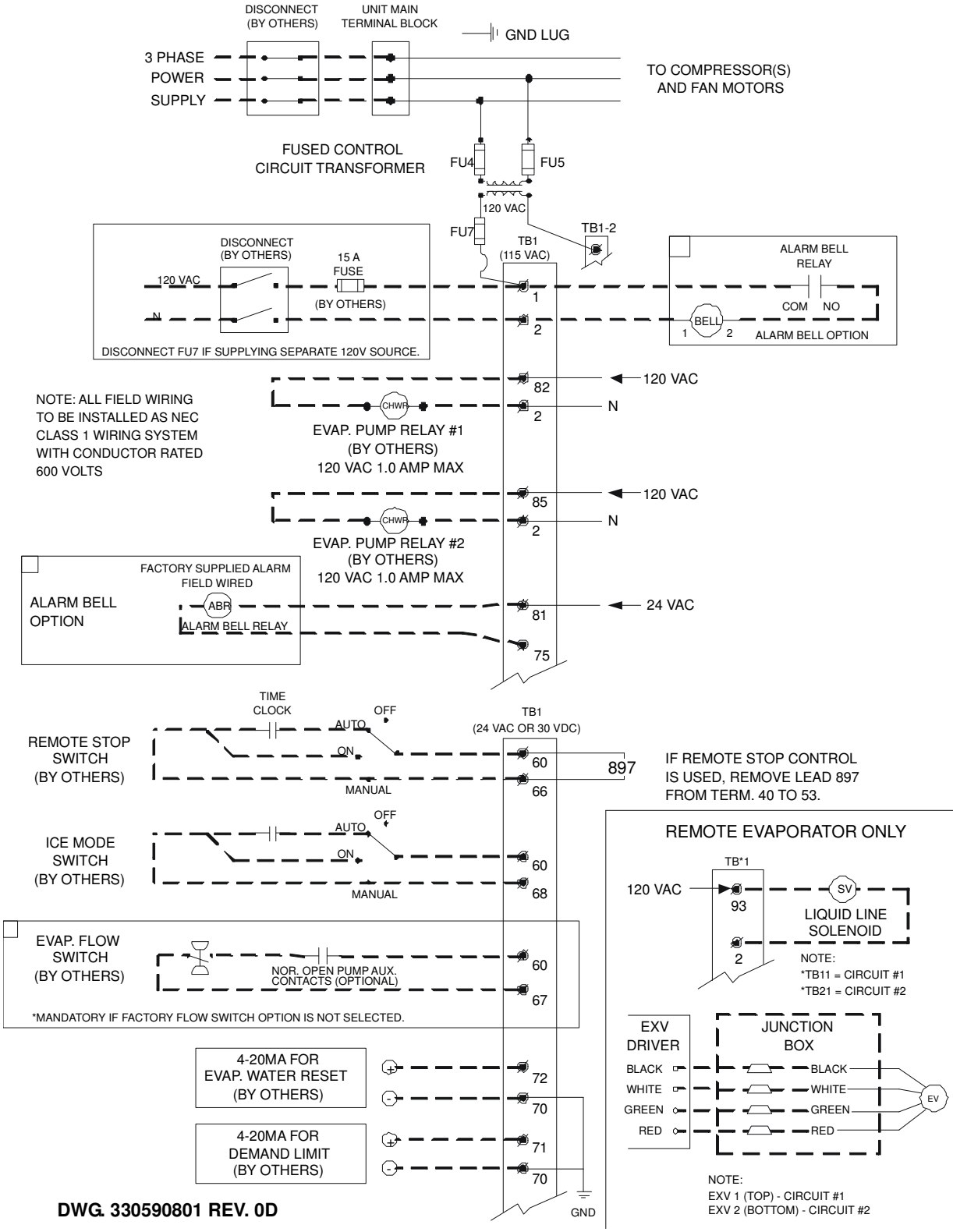
AGS UNIT SIZE	VOLTS	HZ	WIRING TO UNIT DISCONNECT SWITCH			
			TERMINAL SIZE (AMPS)		CONNECTOR WIRE RANGE PER PHASE (COPPER WIRE ONLY)	
			CKT 1	CKT 2	CKT 1	CKT 2
160	208	60	400	600	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	230		400	600	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	380		250	400	#6 – 350 MCM (1/C)	3/0 – 500 MCM (2/C)
	460		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
	575		150	150	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
165	208	60	400	600	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	230		400	600	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	380		250	400	#6 – 350 MCM (1/C)	3/0 – 500 MCM (2/C)
	460		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
	575		150	150	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
170	208	60	600	600	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	230		600	600	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	380		400	400	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	460		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
	575		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
175	208	60	600	600	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	230		600	600	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	380		400	400	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	460		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
	575		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
180	208	60	600	600	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	230		600	600	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	380		400	400	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	460		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
	575		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
190	208	60	600	600	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	230		600	600	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	380		400	400	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	460		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
	575		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
195	208	60	600	600	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	230		600	600	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	380		400	400	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	460		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
	575		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
210	208	60	600	600	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	230		600	600	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	380		400	400	3/0 – 500 MCM (2/C)	3/0 – 500 MCM (2/C)
	460		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)
	575		250	250	#6 – 350 MCM (1/C)	#6 – 350 MCM (1/C)

NOTE:

1. Terminal size amps are the maximum amps that the disconnect switch is rated for.
2. Data based on 75°C wire.
3. (2/C) notation means two cables per conduit.
4. Complete notes are on page 47.

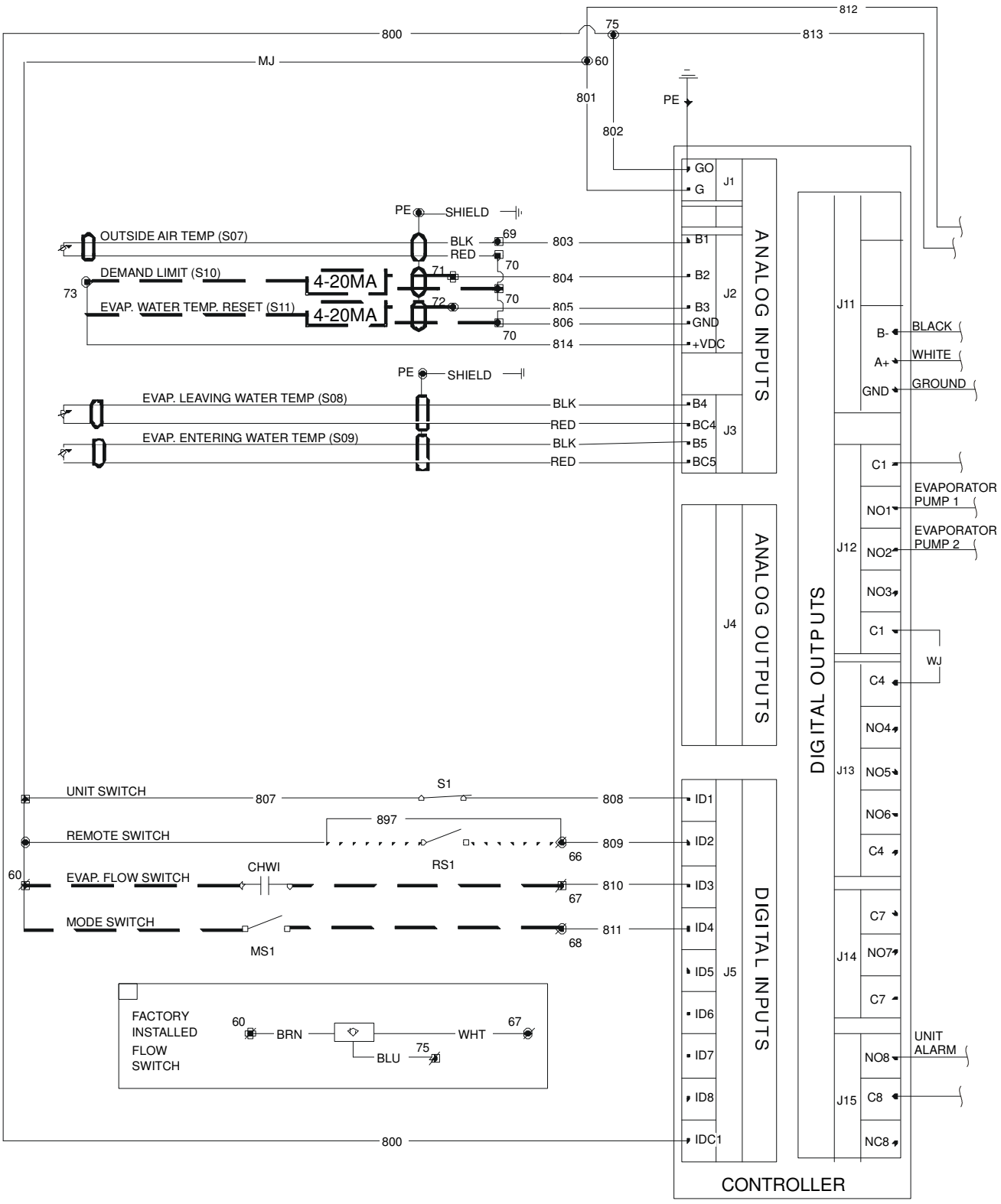
Field Wiring Diagram

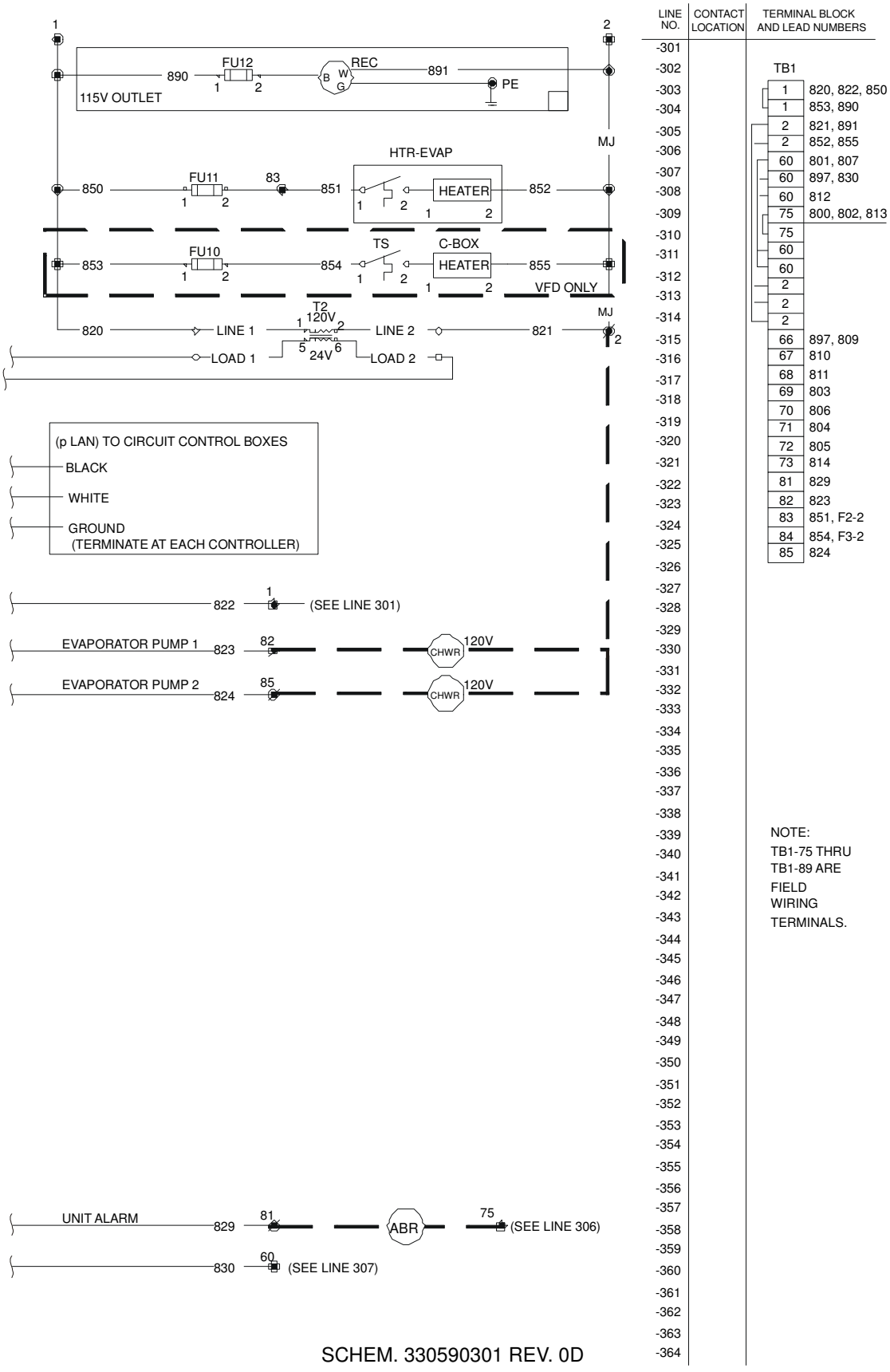
Figure 23, Typical Field Wiring Diagram



NOTE: See page 49 for additional remote evaporator wiring

Figure 24, AGS 120C - 210C Unit Controller Schematic





LINE NO.	CONTACT LOCATION
-301	
-302	
-303	
-304	
-305	
-306	
-307	
-308	
-309	
-310	
-311	
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-313	
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-340	
-341	
-342	
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-355	
-356	
-357	
-358	
-359	
-360	
-361	
-362	
-363	
-364	

TERMINAL BLOCK AND LEAD NUMBERS

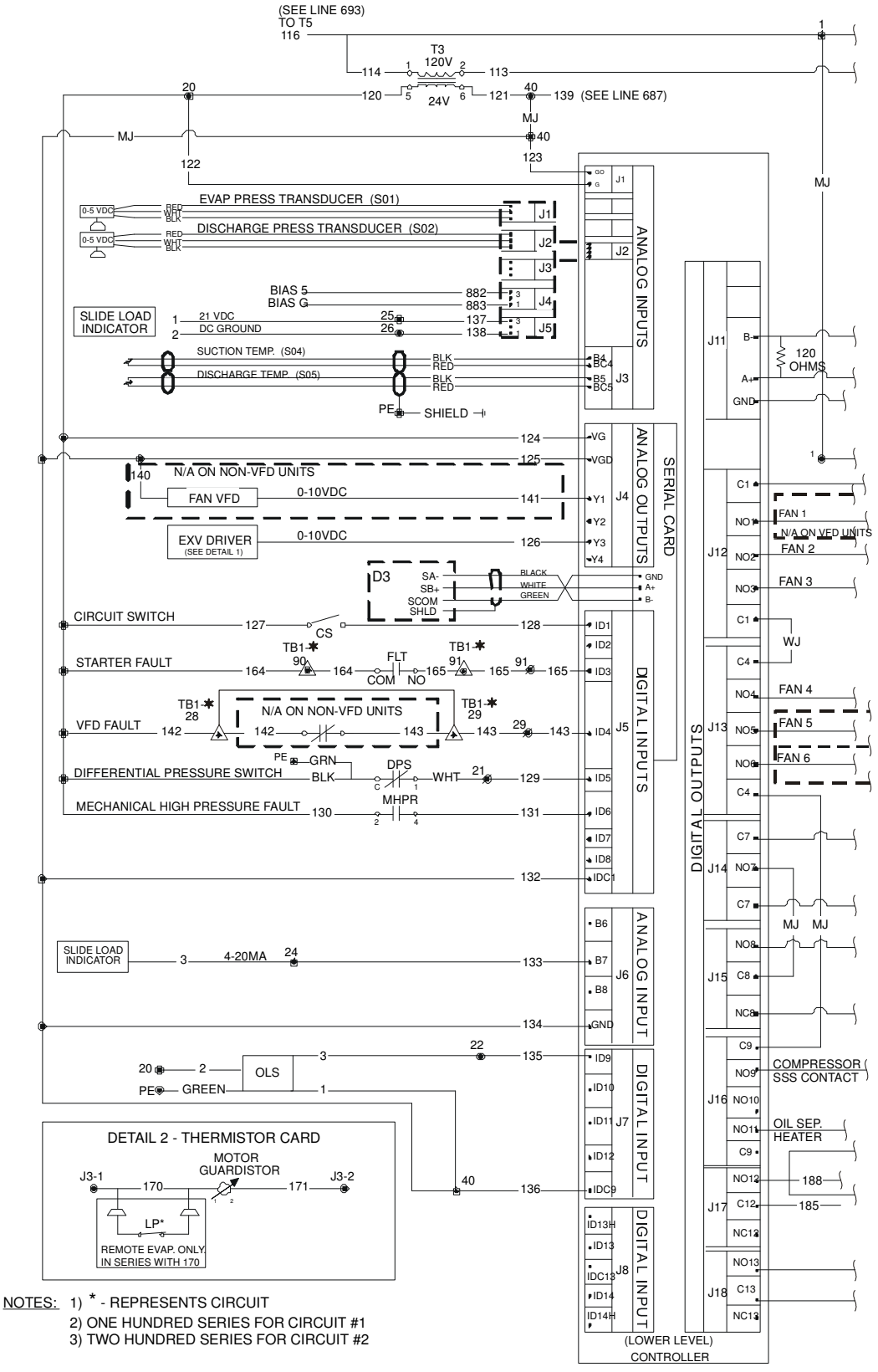
TB1

1	820, 822, 850
1	853, 890
2	821, 891
2	852, 855
60	801, 807
60	897, 830
60	812
75	800, 802, 813
75	
60	
60	
2	
2	
2	
66	897, 809
67	810
68	811
69	803
70	806
71	804
72	805
73	814
81	829
82	823
83	851, F2-2
84	854, F3-2
85	824

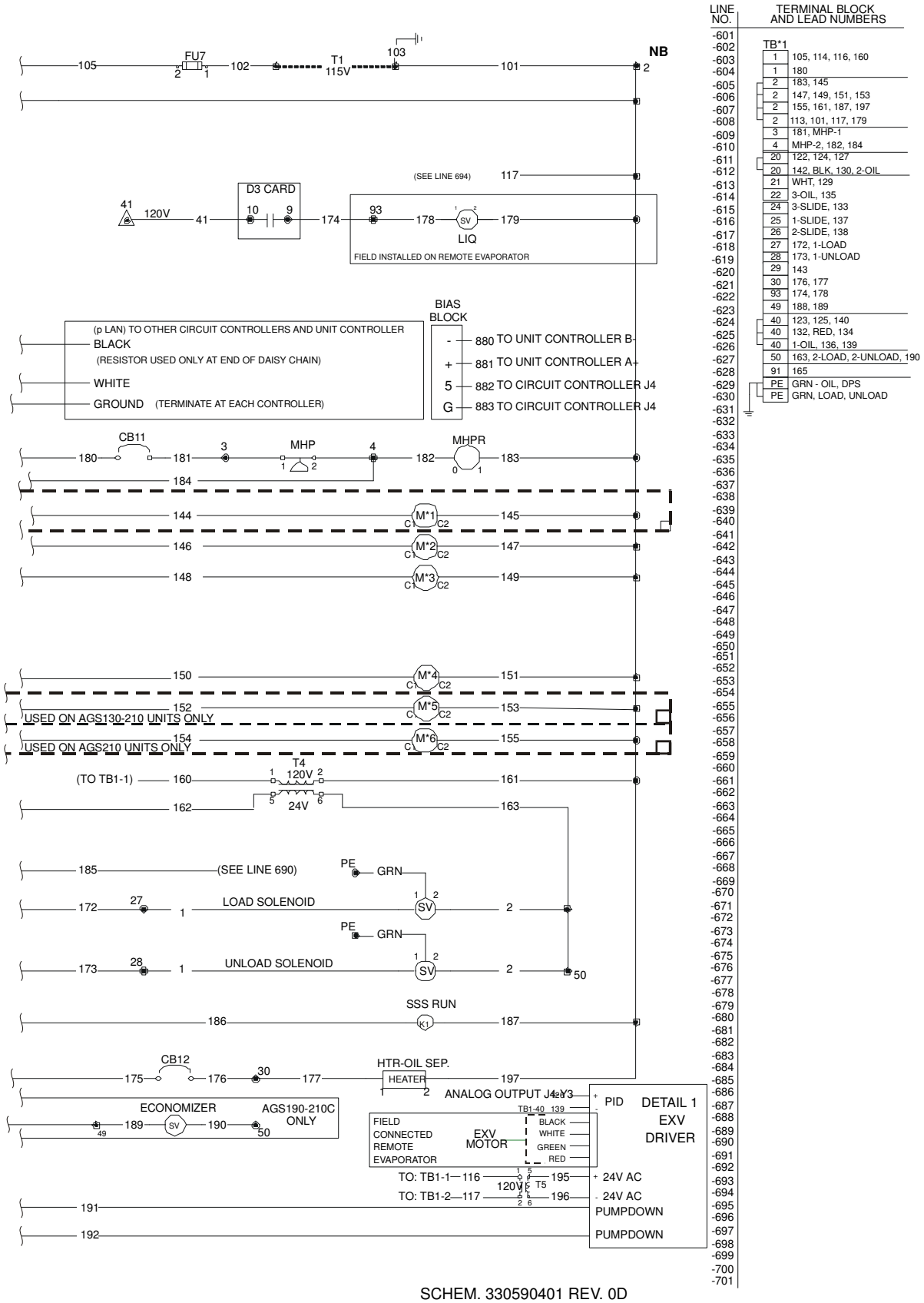
NOTE:
TB1-75 THRU TB1-89 ARE FIELD WIRING TERMINALS.

SCHEM. 330590301 REV. 0D

Figure 25, AGS 120C - 210C Circuit Controller Schematic



NOTES: 1) * - REPRESENTS CIRCUIT
2) ONE HUNDRED SERIES FOR CIRCUIT #1
3) TWO HUNDRED SERIES FOR CIRCUIT #2



LINE NO.	TERMINAL BLOCK AND LEAD NUMBERS
	TB*1
	1 — 105, 114, 116, 160
	1 — 180
	2 — 183, 145
	2 — 147, 149, 151, 153
	2 — 155, 161, 187, 197
	2 — 113, 101, 117, 179
	3 — 181, MHP-1
	4 — MHP-2, 182, 184
	20 — 122, 124, 127
	20 — 142, BLK, 130, 2-OIL
	21 — WHT, 129
	22 — 3-OIL, 135
	24 — 3-SLIDE, 133
	25 — 1-SLIDE, 137
	26 — 2-SLIDE, 138
	27 — 172, 1-LOAD
	28 — 173, 1-UNLOAD
	29 — 143
	30 — 176, 177
	93 — 174, 178
	49 — 188, 189
	40 — 123, 125, 140
	40 — 132, RED, 134
	40 — 1-OIL, 136, 139
	50 — 163, 2-LOAD, 2-UNLOAD, 190
	91 — 165
	PE — GRN - OIL, DPS
	PE — GRN, LOAD, UNLOAD

SCHEM. 330590401 REV. 0D

Electrical Data Notes

Sample	No. of Wires	No. of Conduit
350 MCM	3	1
2-250 MCM	6	1
(2) 250 MCM	6	2
(2) 2-250 MCM	12	2

1. The field wire size designation is explained in the table to the right that defines the number of wires and conduit recommended. A "2" in parenthesis (2) indicates that two conduits are required.
2. Allowable voltage limits
   Unit nameplate 208V/60Hz/3PH: 187V to 229V
   Unit nameplate 230V/60Hz/3Ph: 207V to 253V
   Unit nameplate 380V/60Hz/3Ph: 342V to 418V
   Unit nameplate 460V/60Hz/3Ph: 414V to 506V
   Unit nameplate 575V/60Hz/3Ph: 517V to 633V
   Maximum of 2 percent voltage unbalance.
3. Unit wire size ampacity (MCA) is equal to 125% of the largest compressor-motor RLA plus 100% of RLA of all other loads in the circuit including control transformer. Wire size ampacity for separate 115V control circuit power is 15 amps.
4. Compressor RLA values are for wire sizing purposes only but do reflect normal operating current draw at unit rated capacity.
5. Single point power supply requires a single disconnect to supply electrical power to the unit. This power must be fused.
6. Multiple point power supply requires two independent power circuits.
7. All field wiring to unit power block or optional nonfused disconnect switch must be copper.
8. Field wire size values given in tables apply to 75°C rated wire per NEC.
9. External disconnect switch(s) or HACR breakers must be field supplied.

Note: On single point power units a non-fused disconnect switch in the cabinet is available as an option.

10. All wiring must be done in accordance with applicable local and national codes.
11. Recommended time delay fuse size or HACR breakers is equal to 150% of the largest compressor motor RLA plus 100% of remaining compressor RLAs and the sum of condenser fan FLAs.
12. Maximum time delay fuse size or HACR breakers is equal to 225% of the largest compressor-motor RLA plus 100% of remaining compressor RLAs and the sum of condenser fan FLAs.

Power Limitations:

1. Voltage within ± 10 percent of nameplate rating.
2. Voltage unbalance not to exceed 2% with a resultant current unbalance of 6 to 10 times the voltage unbalance per NEMA MG-1, 1998 Standard.

BAS Interface

Optional Protocol Selectability BAS interfaces: the locations and interconnection requirements for the various standard protocols are found in their respective installation manuals, obtainable from the local McQuay sales office, www.mcquay.com, and also shipped with each unit.

Modbus IM 743 LONWORKS IM 735 BACnet IM 736

Remote Operator Interface Panel

The box containing the optional remote interface panel will have installation instructions, IOM MT II Remote, in it. The manual is also available for downloading from www.mcquay.com.

Remote Evaporator

This section contains data that is unique to AGS-CM/B remote evaporator models including:

- Refrigerant piping on page 49.
- Dimensions on page 51.
- Vibration isolators on page 58.
- Physical data on page 60.

Data common to both packaged and remote evaporator models are:

- Electrical data on page 32.
- Evaporator pressure drop, on page 25.

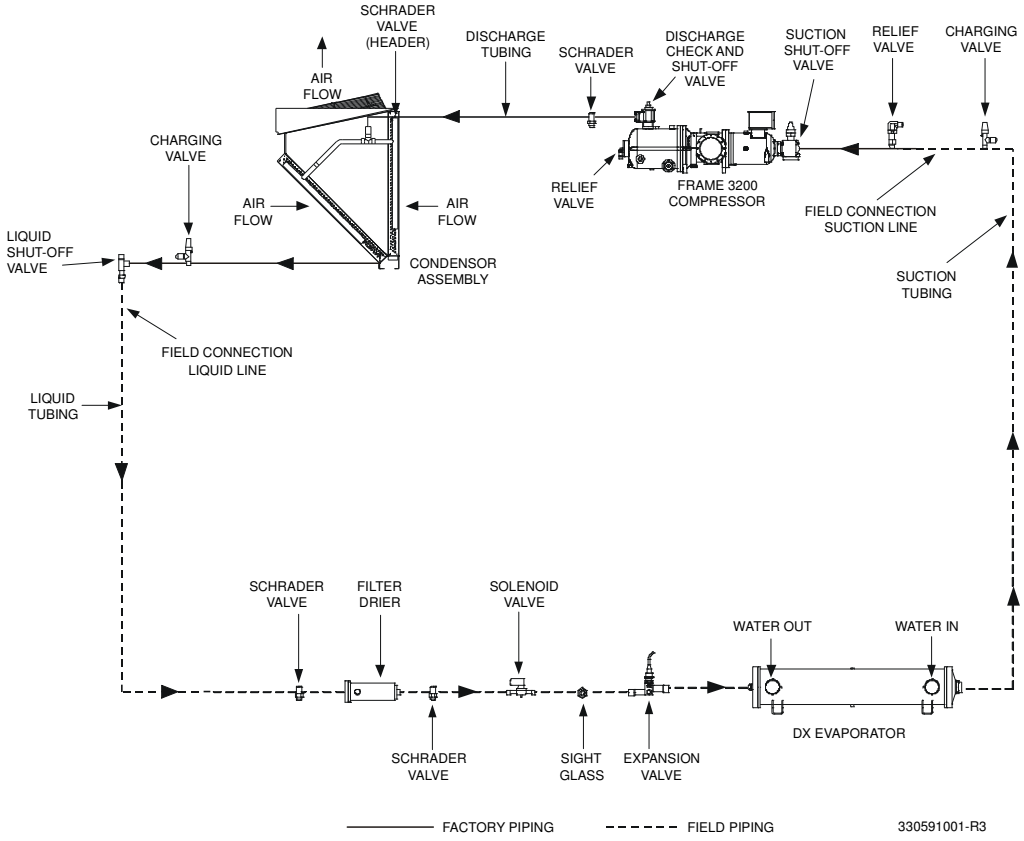
Piping Layout

Figure 26 shows the piping layout for one of the two refrigerant circuits for AGS units with a remote evaporator. Note that the refrigerant specialties are field installed adjacent to the evaporator. The outdoor unit, the evaporator, and a kit of refrigerant components are shipped as separate pieces. The outdoor unit is shipped with an operating charge of refrigerant. Refrigerant for the evaporator and field refrigerant piping is furnished by the contractor and must be added in the field.

The location and size of the refrigerant (and water) connections are shown on the dimension drawings beginning on page 51. Looking at the control panel, circuit #1 is on the left, #2 on the right.

NOTE: All field piping, wiring, and procedures must be performed in accordance with ASHRAE, EPA, and industry standards.

Figure 26, Piping Schematic (Remote Evaporator)



Field Wiring (Remote Evaporator)

Field wiring connections from the remote evaporator to the outdoor unit are shown on Figure 23 on page 42. Additionally, sensor connections 2, 3, and 4 below, are required:

1. The electronic expansion valve has a 30-feet long cable attached and can be used, as is, when the outdoor unit is less than 30 feet away. Beyond that, a junction box must be located within 30 feet of the evaporator, and up to 70 additional feet of 14GA wire connected from the cable to the unit, allowing up to a total distance of 100 feet (30 feet of cable and up to 70 feet of 14GA).
2. Two evaporator water temperature sensors with 100 feet of cable coiled in the unit control panel for extension to the evaporator and insertion in fittings located on the side of the inlet and outlet nozzles.
3. One suction line refrigerant temperature sensor per circuit with 100 feet of cable coiled in the unit control panel for extension to the evaporator. Place the sensor in a brazed well (provided in kit, installed in the field) on the suction line in a straight-flat area, close to the suction line pressure transducer. Install with heat conductive compound and insulate well. If installed on a horizontal pipe run, locate between the 2-4 o'clock position.
4. One suction line pressure transducer per circuit with 100 feet of cable coiled in the unit control panel for extension to the evaporator. Mount the transducer in the suction line, 2-3 feet from the evaporator head, on the top or side of the pipe. Connection is ¼-inch flare with a flare Schrader.

Kit Components

The kit shipped with the unit has the following components for field installation:

Filter-drier and cores	Sight glass
Electronic expansion valve	Solenoid valve
Evaporator vent and drain plugs	Filter-drier cores for economizer piping
Charging Valve	(Sizes AGS 180 through 210)

Refrigerant Line Sizing

Layout and size the refrigerant piping in accordance with the latest edition of the ASHRAE Handbook. A line sizing guide can be found below. Keep the refrigerant suction line pressure drop at close to a maximum of 2-degree F. drop in saturated temperature. Each of the two suction line's velocity must be sufficient to carry oil when considering a capacity reduction of 25% in each circuit.

NOTE: The following applies to all size units:

- Do not run refrigerant piping underground.
- Maximum linear line length can not exceed 75 feet.
- Maximum total equivalent length (TEL) can not exceed 180 feet.
- The evaporator can not be located more than 15 feet above the outdoor unit.
- The evaporator can not be located more than 20 feet below the outdoor unit.
- Suction line connection at unit = 3 5/8 inches.
- Suction line connection at evaporator = 4 1/8 inches.
- Liquid line connection at the unit = 1 3/8.
- Liquid line connection at the evaporator = 1 5/8.
- A piping drawing showing altitudes, line lengths, slopes and all fittings, using Form SF 99006 (Revised 5/02), must be sent to the McQuay Technical Response Center for review prior to entering a unit order.
- When facing the unit control box, the left-hand compressor is circuit # 1, and the right-hand is compressor # 2. With mix-matched compressor sizes, #1 is the smallest.

Table 27, Fitting Equivalent Feet of Pipe

Line Size In. OD	Angle Valve	Globe Valve	Ball Valve	90 Degree Std. Radius Elbow	90 Degree Long Radius Elbow
2 5/8	29.00	69.0	1.0	6.0	4.1
3 1/8	35.0	84.0	1.0	7.5	5.0
3 5/8	41.0	100.0	1.0	9.0	5.9
4 1/8	47.0	120.0	1.0	10.0	6.7

Table 28, Recommended Horizontal or Downflow Suction Line Size

AGS Model	Circuit	Up to 50 Equiv. Ft.		Up to 75 Equiv. Ft.		Up to 100 Equiv. Ft.		Up to 125 Equiv. Ft.		Up to 150 Equiv. Ft.	
		Size	PD	Size	PD	Size	PD	Size	PD	Size	PD
120/125	Both	3 5/8	0.54	3 5/8	0.80	3 5/8	1.07	3 5/8	1.34	3 5/8	1.61
130/135	#1	3 5/8	0.54	3 5/8	0.80	3 5/8	1.07	3 5/8	1.34	3 5/8	1.61
	#2	3 5/8	0.71	3 5/8	1.06	3 5/8	1.42	3 5/8	1.77	3 5/8	2.12
140/145	Both	3 5/8	0.71	3 5/8	1.06	3 5/8	1.42	3 5/8	1.77	3 5/8	2.12
160/165	# 1	3 5/8	0.71	3 5/8	1.06	3 5/8	1.42	3 5/8	1.77	3 5/8	2.12
	# 2	3 5/8	1.00	3 5/8	1.51	3 5/8	2.01	4 1/8	1.36	4 1/8	1.63
170 to 210	Both	3 5/8	1.00	3 5/8	1.51	3 5/8	2.01	4 1/8	1.36	4 1/8	1.63

NOTE: "Size" is tubing size in inches, "PD" is the pressure drop in equivalent degrees F. The line pressure drop can be interpolated by feet.

Table 29, Recommended Upflow Suction line Size

AGS Model	Circuit	Up to 50 Equiv. Ft.		Up to 75 Equiv. Ft.		Up to 100 Equiv. Ft.	
		Size	PD	Size	PD	Size	PD
120/125	Both	3 1/8	1.09	3 1/8	1.64	3 1/8	2.19
130/135	#1	3 1/8	1.09	3 1/8	1.64	3 1/8	2.19
	#2	3 1/8	0.71	3 1/8	1.06	3 1/8	1.42
140/145	Both	3 1/8	0.71	3 1/8	1.06	3 1/8	1.42
160/165	# 1	3 1/8	0.71	3 1/8	1.06	3 1/8	1.42
	# 2	3 5/8	1.00	3 5/8	1.51	3 5/8	2.01
170 to 210	Both	3 5/8	1.00	3 5/8	1.51	3 5/8	2.01

NOTE: "Size" is tubing size in inches, "PD" is the pressure drop in equivalent degrees F. The line pressure drop can be interpolated by feet.

Table 30, Recommended Liquid line Size.

AGS Model	Circuit	Up to 50 Equiv. Ft.		Up to 75 Equiv. Ft.		Up to 100 Equiv. Ft.		Up to 125 Equiv. Ft.		Up to 150 Equiv. Ft.	
		Size	PD	Size	PD	Size	PD	Size	PD	Size	PD
120/125	Both	1 3/8	0.69	1 3/8	1.04	1 3/8	1.39	1 3/8	1.74	1 3/8	2.08
130/135	#1	1 3/8	0.69	1 3/8	1.04	1 3/8	1.39	1 3/8	1.74	1 3/8	2.08
	#2	1 3/8	0.92	1 3/8	1.37	1 3/8	1.83	1 3/8	2.29	1 3/8	2.75
140/145	Both	1 3/8	0.92	1 3/8	1.37	1 3/8	1.83	1 3/8	2.29	1 3/8	2.75
160/165	# 1	1 3/8	0.92	1 3/8	1.37	1 3/8	1.83	1 3/8	2.29	1 3/8	2.75
	# 2	1 3/8	1.30	1 3/8	1.95	1 3/8	2.6	1 3/8	3.25	1 3/8	3.90
170 to 210	Both	1 3/8	1.30	1 3/8	1.95	1 3/8	2.6	1 3/8	3.25	1 3/8	3.90

NOTE: "Size" is tubing size in inches, "PD" is the pressure drop in equivalent degrees F. The line pressure drop can be interpolated by feet.

Dimensions, Unit with Remote Evaporator

Figure 27, Models AGS 120CM/B, 130CM/B, 140CM/B, 160CM/B

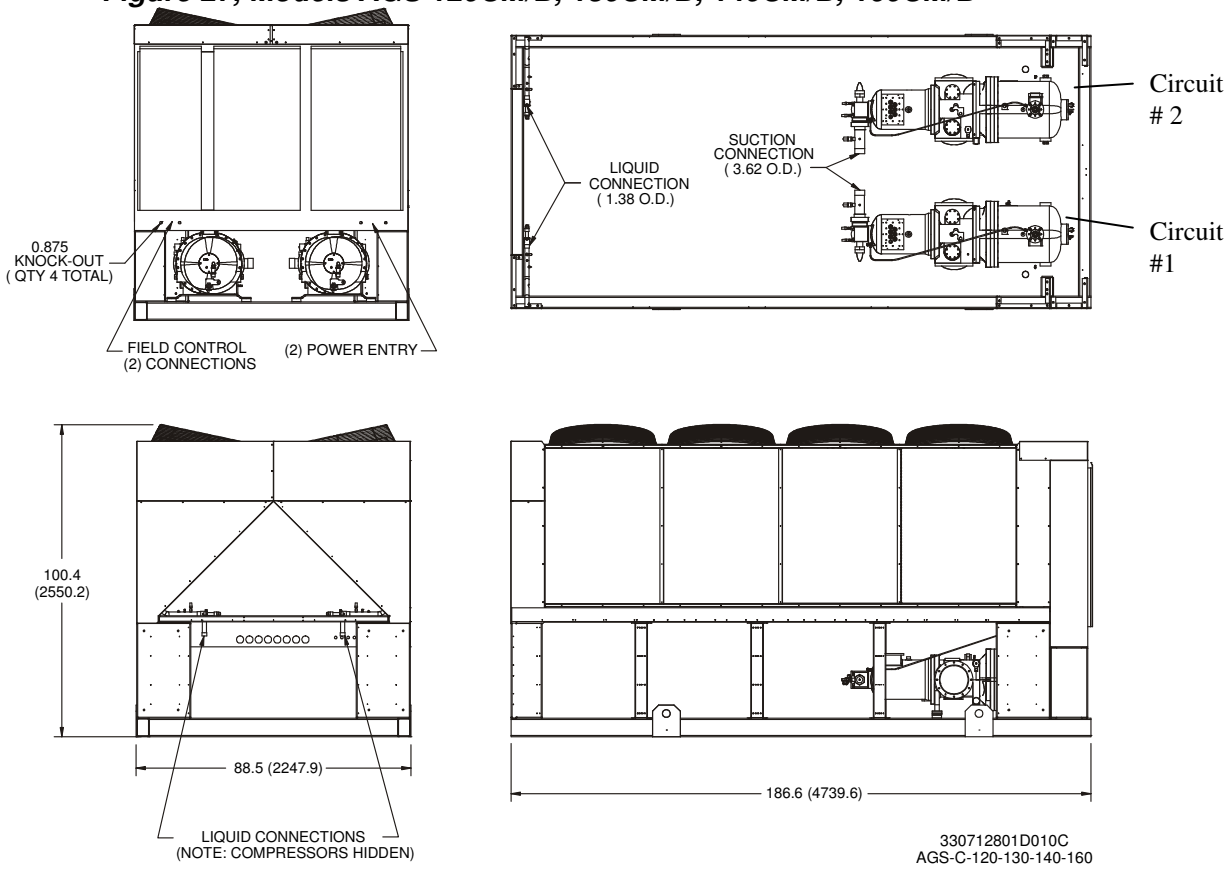


Figure 28, Models AGS 125CM/B, 135CM/B, 145CM/B, 170CM/B

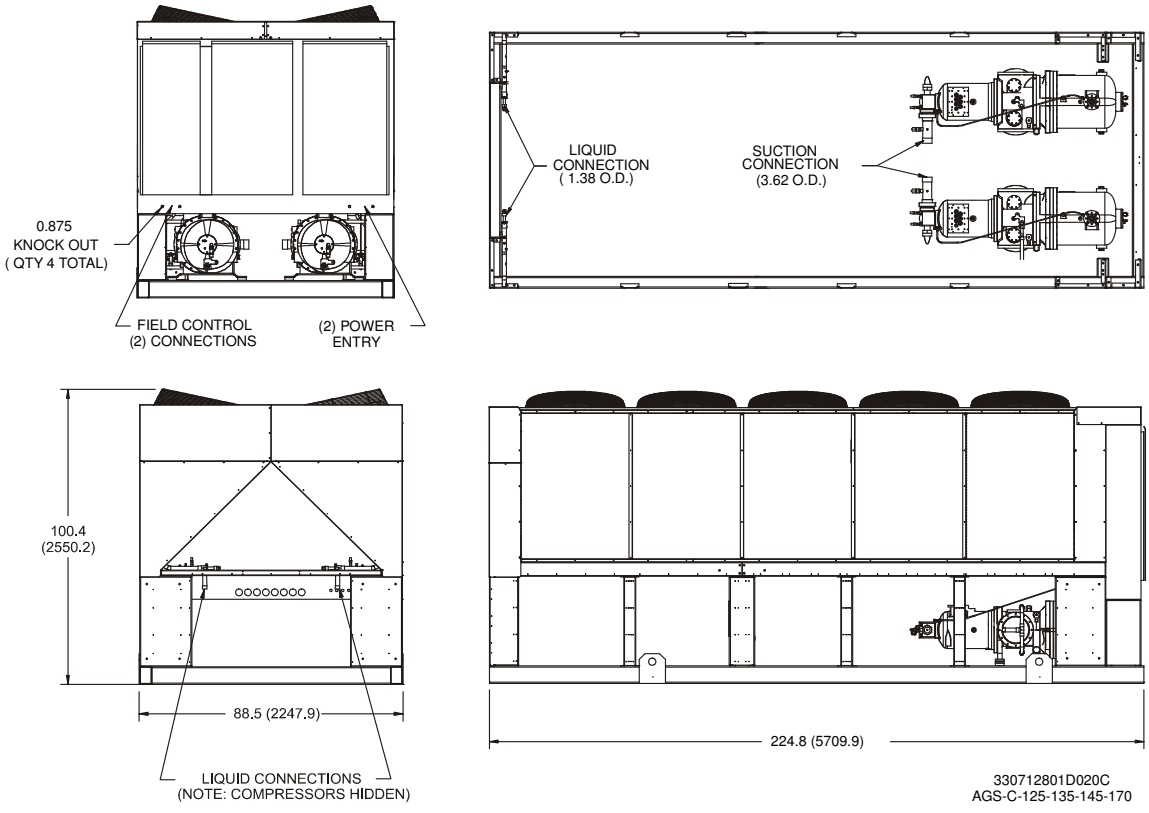


Figure 29, AGS 165CM/B – AGS 175CM/B (with Remote Evaporator)

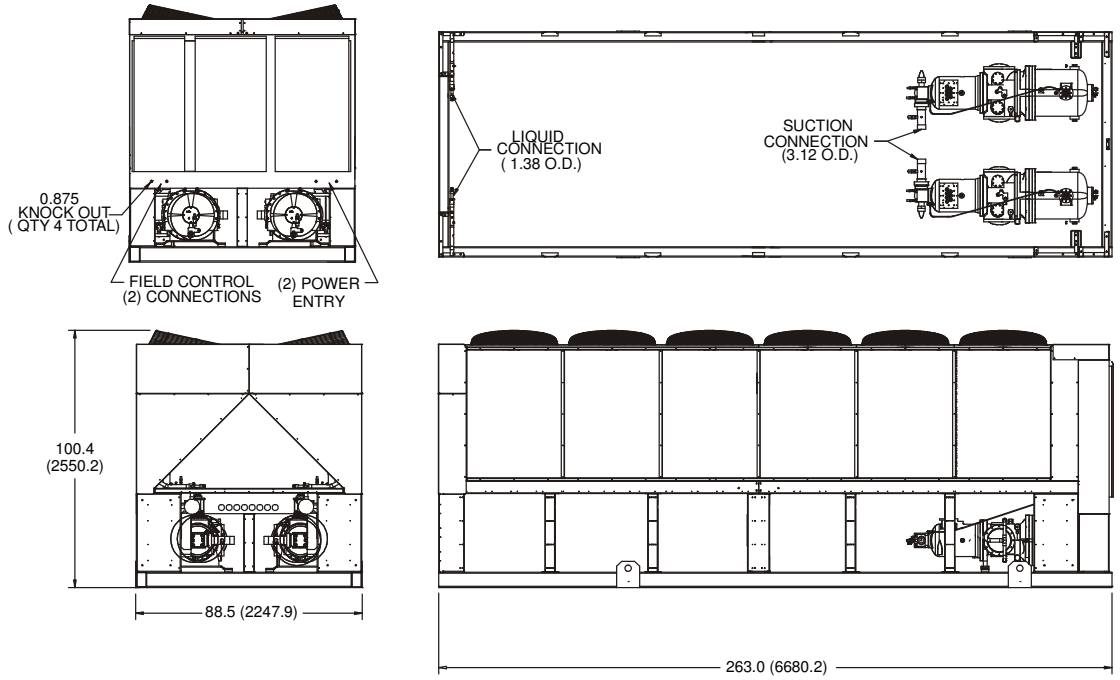


Figure 30, AGS 180CM/B - AGS 190CM/B (with Remote Evaporator)

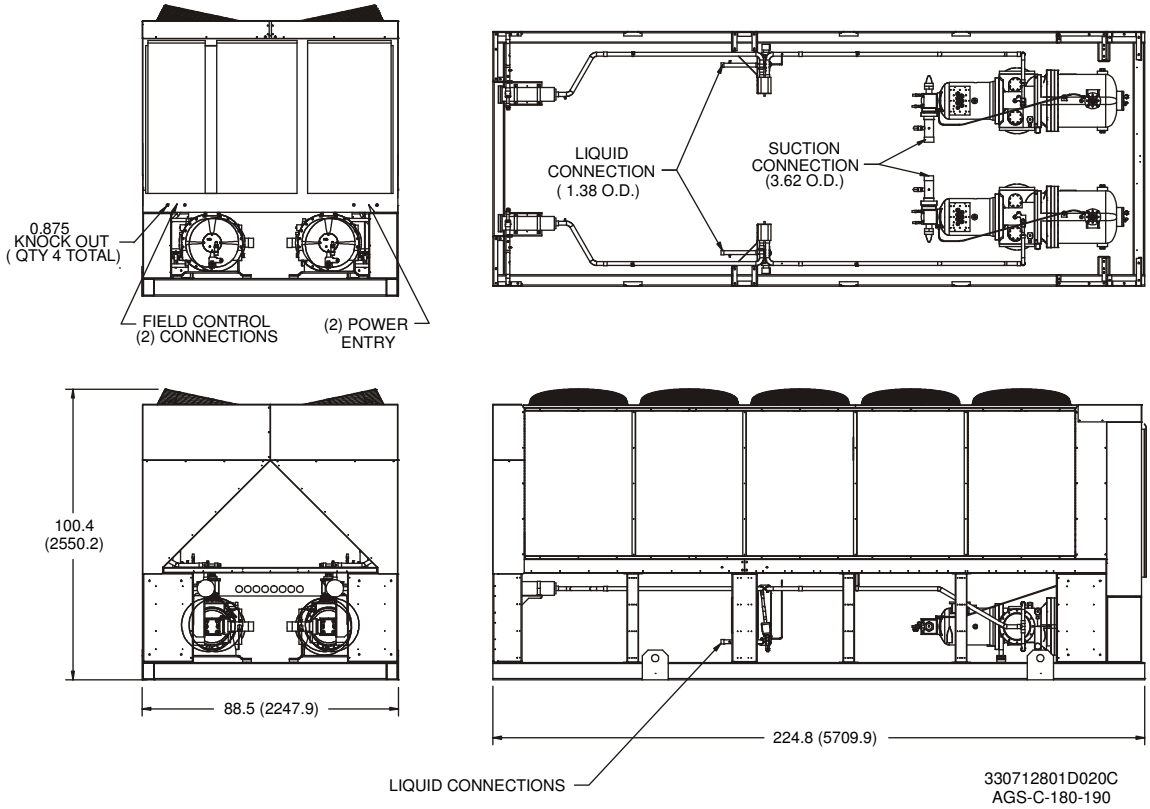
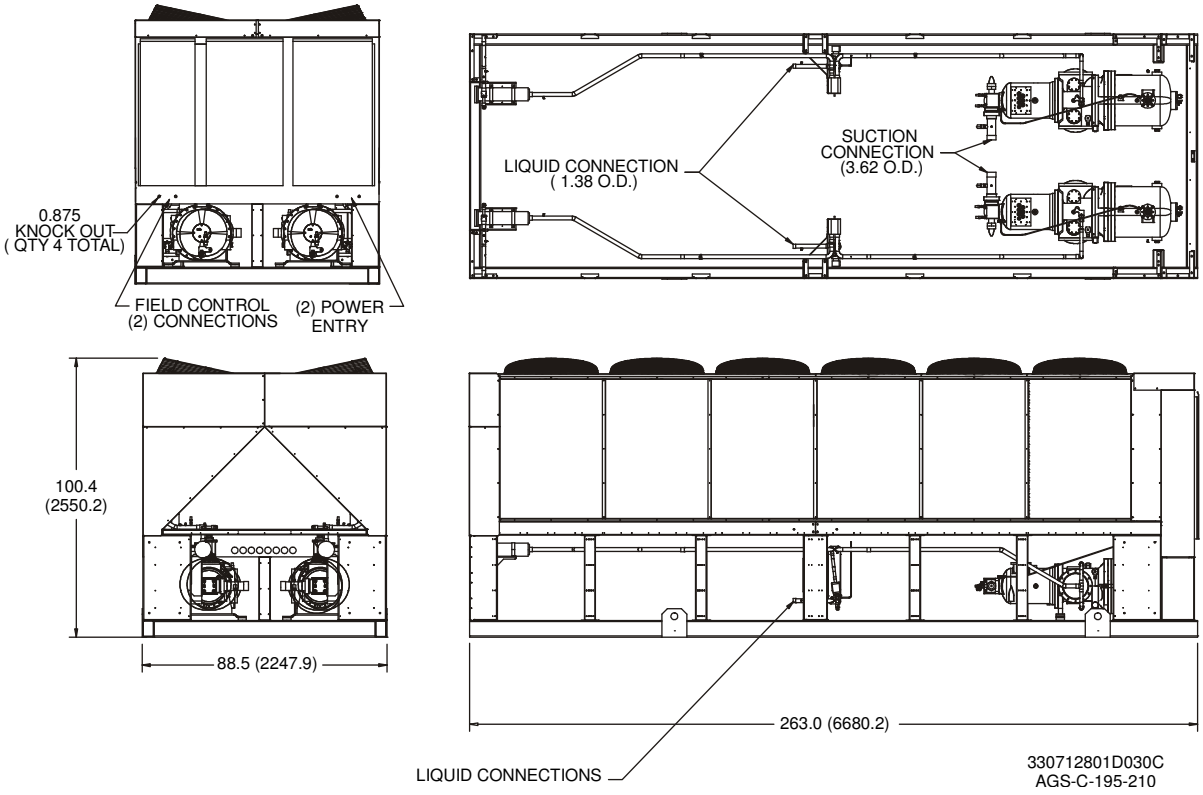


Figure 31, AGS 195CM/B - AGS 210CM/B (with Remote Evaporator)



Evaporators

Figure 32, Evaporator for AGS 120C - 140C

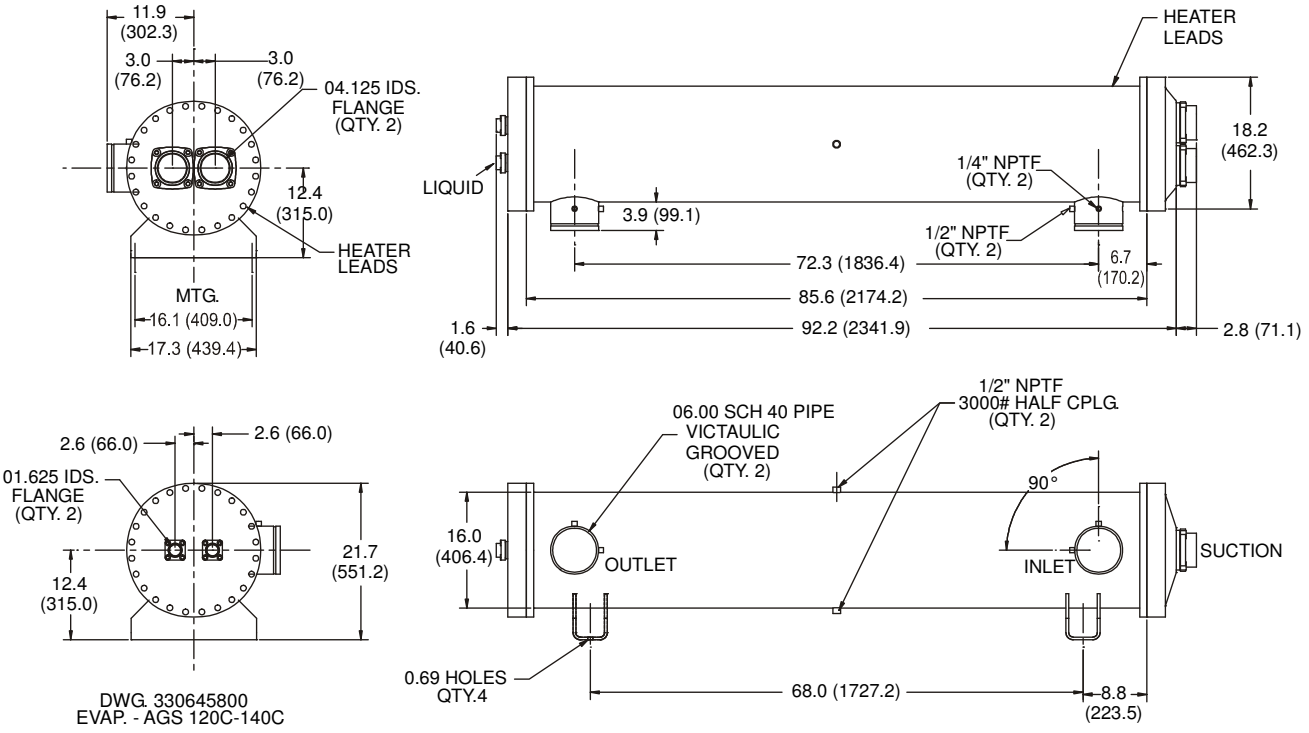


Figure 33, Evaporator for AGS 160C, AGS 125C - 135C

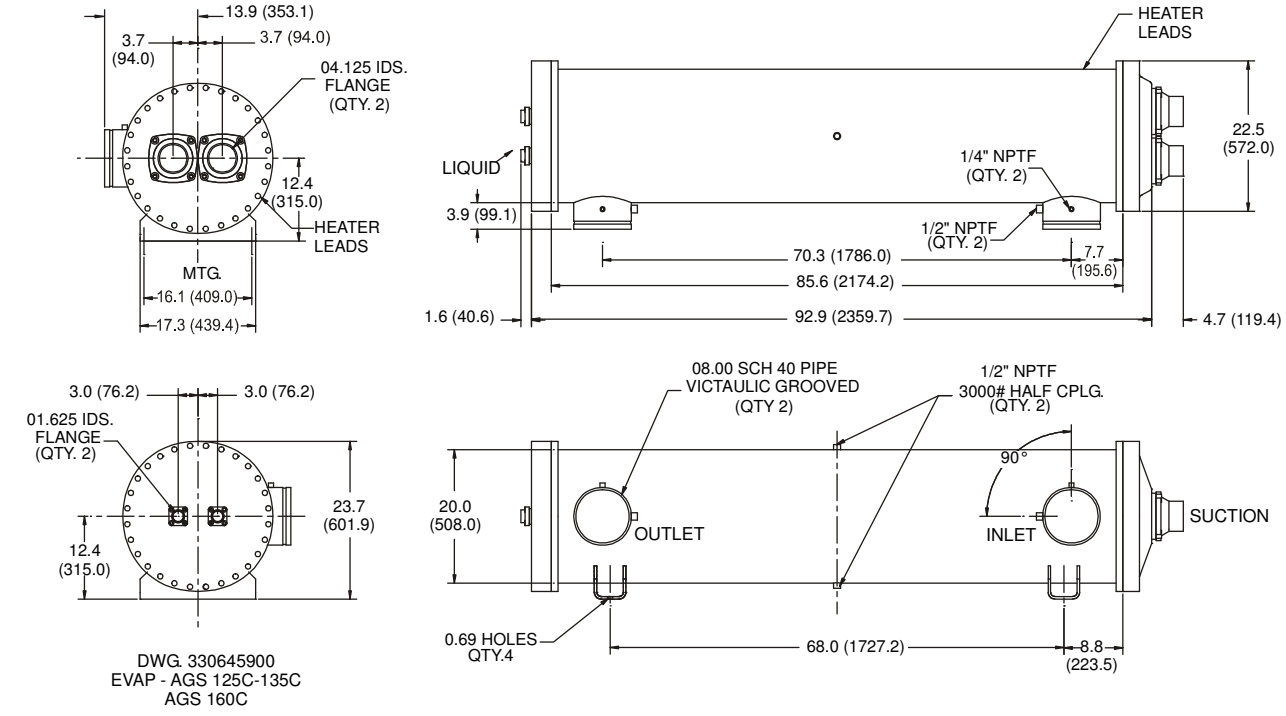


Figure 34, Evaporator for AGS 145C

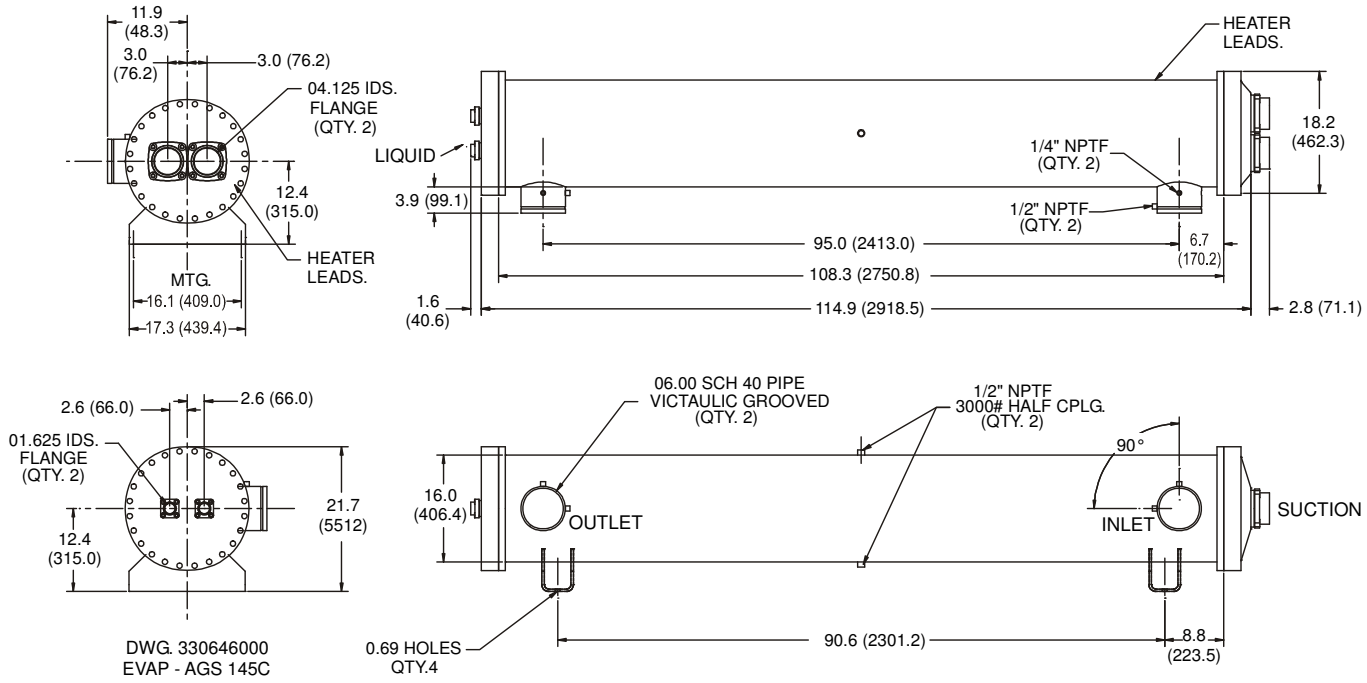
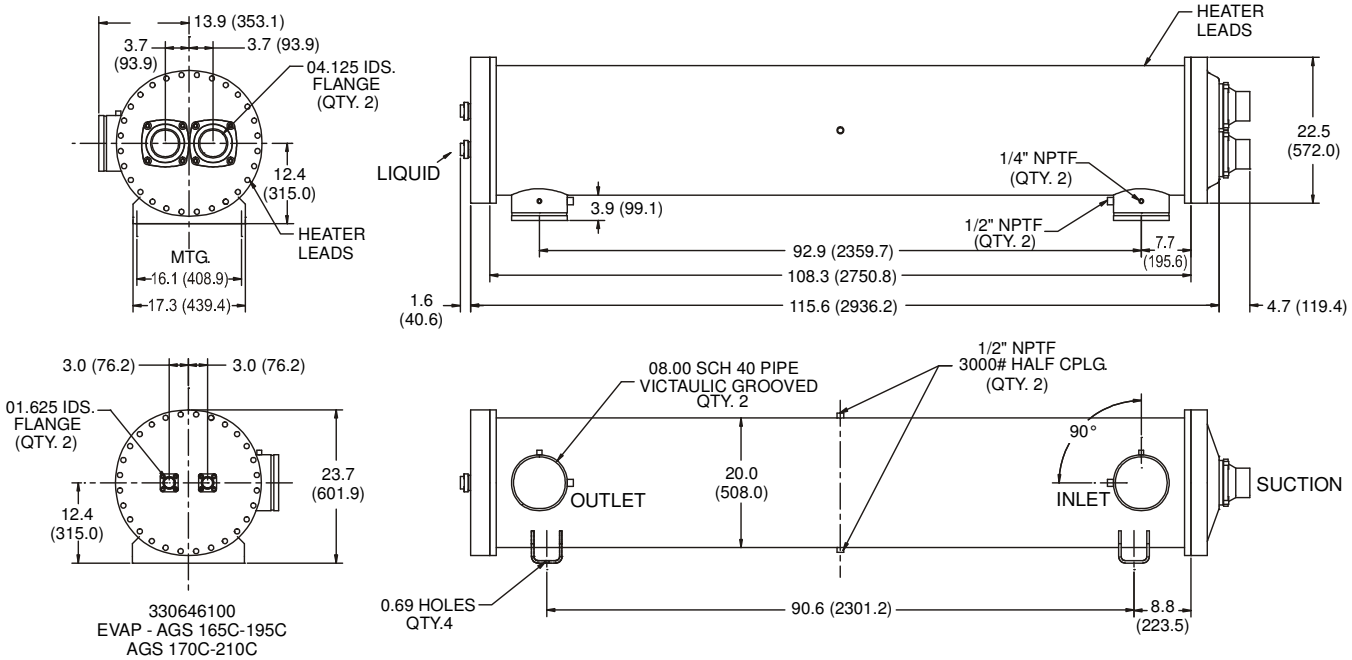
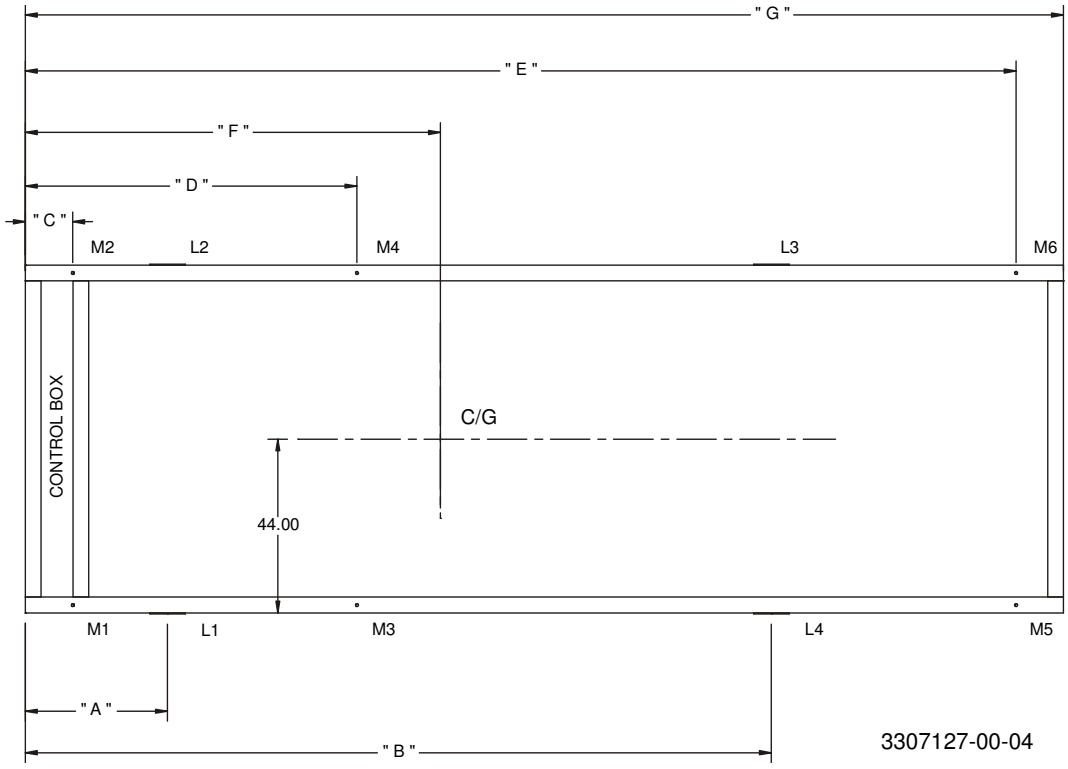


Figure 35, Evaporator for AGS 165C - 195C, AGS 170C - 210C



Lifting and Mounting Dimensions and Weights, Remote Evaporator

Figure 36, Mounting and Lifting Dimensions



AGS MODEL	DIMENSIONS IN INCHES						
	A	B	C	D	E	F	G
120	36.00	136.60	12.00	57.30	174.60	61.36	186.60
125	36.00	168.85	12.00	69.25	212.80	74.80	224.80
130	36.00	136.60	12.00	57.30	174.60	61.36	186.60
135	36.00	168.85	12.00	69.25	212.80	74.80	224.80
140	36.00	136.60	12.00	57.30	174.60	61.36	186.60
145	36.00	168.85	12.00	69.25	212.80	74.80	224.80
160	36.00	136.60	12.00	57.30	174.60	61.36	186.60
165	36.00	189.00	12.00	84.00	251.00	86.83	263.00
170	36.00	168.85	12.00	69.25	212.80	74.80	224.80
175	36.00	189.00	12.00	84.00	251.00	86.83	263.00
180	36.00	168.85	12.00	69.25	212.80	74.80	224.80
190	36.00	168.85	12.00	69.25	212.80	74.80	224.80
195	36.00	188.77	12.00	84.00	251.00	86.83	263.00
210	36.00	188.77	12.00	84.00	251.00	86.83	263.00

NOTES:
1. Center of gravity (f) is calculated from shipping weight.
2. Dimensions in inches.

Table 31, Lifting and Mounting Weights, Aluminum Fins (Remote Evaporator)

AGS MODEL	Lifting Weights				Mounting Weights						Operating & Shipping Weights	
	L1 & L2		L3 & L4		M1 & M2		M3 & M4		M5 & M6			
	lbs.	kg	lbs.	kg	lbs.	kg	lbs.	kg	lbs.	kg	lbs.	kg
120	3029	1375	1021	464	1747	793	1488	676	815	370	8100	8100
125	3169	1439	1307	593	1910	867	1632	741	935	424	8952	8952
130	3029	1375	1021	464	1747	793	1488	676	815	370	8100	8100
135	3169	1439	1307	593	1910	867	1632	741	935	424	8952	8952
140	3029	1375	1021	464	1747	793	1488	676	815	370	8100	8100
145	3169	1439	1307	593	1910	867	1632	741	935	424	8952	8952
160	3029	1375	1021	464	1747	793	1488	676	815	370	8100	8100
165	3196	1451	1590	722	2071	940	1741	790	974	442	9571	9571
170	3169	1439	1307	593	1910	867	1632	741	935	424	8952	8952
175	3196	1451	1590	722	2071	940	1741	790	974	442	9571	9571
180	3169	1439	1307	593	1910	867	1632	741	935	424	8952	8952
190	3169	1439	1307	593	1910	867	1632	741	935	424	8952	8952
195	3196	1451	1590	722	2071	940	1741	790	974	442	9571	9571
210	3196	1451	1590	722	2071	940	1741	790	974	442	9571	9571

NOTE: Refer to Figure 36.

Table 32, Lifting and Mounting Weights, Copper Fins (Remote Evaporator)

AGS MODEL	Lifting Weights				Mounting Weights						Operating & Shipping Weights	
	L1 & L2		L3 & L4		M1 & M2		M3 & M4		M5 & M6			
	lbs.	kg	lbs.	kg	lbs.	kg	lbs.	kg	lbs.	kg	lbs.	kg
120	3348	1520	1340	608	1960	890	1701	772	1028	467	9376	4257
125	3568	1620	1706	775	2176	988	1898	862	1201	545	10548	4789
130	3348	1520	1340	608	1960	890	1701	772	1028	467	9376	4257
135	3568	1620	1706	775	2176	988	1898	862	1201	545	10548	4789
140	3348	1520	1340	608	1960	890	1701	772	1028	467	9376	4257
145	3568	1620	1706	775	2176	988	1898	862	1201	545	10548	4789
160	3348	1520	1340	608	1960	890	1701	772	1028	467	9376	4257
165	3675	1668	2069	939	2390	1085	2060	935	1293	587	11487	5215
170	3568	1620	1706	775	2176	988	1898	862	1201	545	10548	4789
175	3675	1668	2069	939	2390	1085	2060	935	1293	587	11487	5215
180	3568	1620	1706	775	2176	988	1898	862	1201	545	10548	4789
190	3568	1620	1706	775	2176	988	1898	862	1201	545	10548	4789
195	3675	1668	2069	939	2390	1085	2060	935	1293	587	11487	5215
210	3675	1668	2069	939	2390	1085	2060	935	1293	587	11487	5215

NOTE: Refer to Figure 36.

Vibration Isolators, Remote Evaporator

The vibration isolator specific locations and the kit numbers shown on the following two pages are based on Figure 36 and the weights shown on the previous page.

Table 33, Spring Vibration Isolators, AGS 120C – 210C, Aluminum Fin

AGS Model	Mounting Location						
	M1	M2	M3	M4	M5	M6	Kit Number
120	CP2-28	CP2-28	CP2-27	CP2-27	CP1-28	CP1-28	330904121
	GREEN	GREEN	ORANGE	ORANGE	GREEN	GREEN	
125	CP2-31	CP2-31	CP2-28	CP2-28	CP1-31	CP1-31	330904122
	GRAY	GRAY	GREEN	GREEN	WHITE	WHITE	
130	CP2-28	CP2-28	CP2-27	CP2-27	CP1-28	CP1-28	330904121
	GREEN	GREEN	ORANGE	ORANGE	GREEN	GREEN	
135	CP2-31	CP2-31	CP2-28	CP2-28	CP1-31	CP1-31	330904122
	GRAY	GRAY	GREEN	GREEN	WHITE	WHITE	
140	CP2-28	CP2-28	CP2-27	CP2-27	CP1-28	CP1-28	330904121
	GREEN	GREEN	ORANGE	ORANGE	GREEN	GREEN	
145	CP2-31	CP2-31	CP2-28	CP2-28	CP1-31	CP1-31	330904122
	GRAY	GRAY	GREEN	GREEN	WHITE	WHITE	
160	CP2-28	CP2-28	CP2-27	CP2-27	CP1-28	CP1-28	330904121
	GREEN	GREEN	ORANGE	ORANGE	GREEN	GREEN	
165	CP2-31	CP2-31	CP2-28	CP2-28	CP1-31	CP1-31	330904122
	GRAY	GRAY	GREEN	GREEN	WHITE	WHITE	
170	CP2-31	CP2-31	CP2-28	CP2-28	CP1-31	CP1-31	
	GRAY	GRAY	GREEN	GREEN	WHITE	WHITE	
175	CP2-31	CP2-31	CP2-28	CP2-28	CP1-31	CP1-31	
	GRAY	GRAY	GREEN	GREEN	WHITE	WHITE	
180	CP2-31	CP2-31	CP2-28	CP2-28	CP1-31	CP1-31	
	GRAY	GRAY	GREEN	GREEN	WHITE	WHITE	
190	CP2-31	CP2-31	CP2-28	CP2-28	CP1-31	CP1-31	
	GRAY	GRAY	GREEN	GREEN	WHITE	WHITE	
195	CP2-31	CP2-31	CP2-28	CP2-28	CP1-31	CP1-31	
	GRAY	GRAY	GREEN	GREEN	WHITE	WHITE	
210	CP2-31	CP2-31	CP2-28	CP2-28	CP1-31	CP1-31	
	GRAY	GRAY	GREEN	GREEN	WHITE	WHITE	

Table 34, Neoprene-in-Shear Isolators, AGS 120C – 210C, Aluminum Fin

AGS Model	Mounting Location (See Footprint Drawings, page 13)						
	M1	M2	M3	M4	M5	M6	Kit Number
120	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, BLACK	RP-4, BLACK	330904111
125	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, BLACK	RP-4, BLACK	
130	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, BLACK	RP-4, BLACK	
135	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	330904112
140	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, BLACK	RP-4, BLACK	330904111
145	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	330904112
160	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
165	RP-4, GRN	RP-4, GRN	RP-4, RED	RP-4, RED	RP-4, BLACK	RP-4, BLACK	330904131
170	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	330904112
175	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
180	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
190	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
195	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
210	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	

Table 35, Spring Vibration Isolators, AGS 120C – 210C, Copper Fin (Remote Evaporator)

AGS Model	Mounting Location						
	M1	M2	M3	M4	M5	M6	Kit Number
120	CP2-31	CP2-31	CP2-28	CP2-28	CP1-31	CP1-31	330904122
	GRAY	GRAY	GREEN	GREEN	WHITE	WHITE	
125	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	330904123
	GRAY	GRAY	GRAY	GRAY	GRAY	GRAY	
130	CP2-31	CP2-31	CP2-28	CP2-28	CP1-31	CP1-31	330904122
	GRAY	GRAY	GREEN	GREEN	WHITE	WHITE	
135	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	330904123
	GRAY	GRAY	GRAY	GRAY	GRAY	GRAY	
140	CP2-31	CP2-31	CP2-28	CP2-28	CP1-31	CP1-31	330904122
	GRAY	GRAY	GREEN	GREEN	WHITE	WHITE	
145	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	330904123
	GRAY	GRAY	GRAY	GRAY	GRAY	GRAY	
160	CP2-31	CP2-31	CP2-28	CP2-28	CP1-31	CP1-31	330904122
	GRAY	GRAY	GREEN	GREEN	WHITE	WHITE	
165	CP2-32	CP2-32	CP2-31	CP2-31	CP2-31	CP2-31	330904105
	WHITE	WHITE	GRAY	GRAY	GRAY	GRAY	
170	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	330904123
	GRAY	GRAY	GRAY	GRAY	GRAY	GRAY	
175	CP2-32	CP2-32	CP2-31	CP2-31	CP2-31	CP2-31	330904105
	WHITE	WHITE	GRAY	GRAY	GRAY	GRAY	
180	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	330904123
	GRAY	GRAY	GRAY	GRAY	GRAY	GRAY	
190	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	CP2-31	
	GRAY	GRAY	GRAY	GRAY	GRAY	GRAY	
195	CP2-32	CP2-32	CP2-31	CP2-31	CP2-31	CP2-31	330904105
	WHITE	WHITE	GRAY	GRAY	GRAY	GRAY	
210	CP2-32	CP2-32	CP2-31	CP2-31	CP2-31	CP2-31	
	WHITE	WHITE	GRAY	GRAY	GRAY	GRAY	

Table 36, Neoprene-in-Shear Isolators, AGS 120C – 210C, Copper Fin

AGS Model	Mounting Location (See Footprint Drawing, page 13)						
	M1	M2	M3	M4	M5	M6	Kit Number
120	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, BLK	RP-4, BLK	330904111
125	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, BLK	RP-4, BLK	
130	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	330904112
135	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
140	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
145	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
160	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
165	RP-4, GRN	RP-4, GRN	RP-4, RED	RP-4, RED	RP-4, BLK	RP-4, BLK	330904131
170	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	330904112
175	RP-4, GRN	RP-4, GRN	RP-4, GRN	RP-4, GRN	RP-4, RED	RP-4, RED	330904113
180	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	330904112
190	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	RP-4, RED	
195	RP-4, GRN	RP-4, GRN	RP-4, GRN	RP-4, GRN	RP-4, RED	RP-4, RED	330904113
210	RP-4, GRN	RP-4, GRN	RP-4, GRN	RP-4, GRN	RP-4, RED	RP-4, RED	

Physical Data, Standard Efficiency

Table 37, Physical Data, AGS 120C – AGS 140C (Remote Evaporator)

DATA	AGS MODEL NUMBER					
	120C		130C		140C	
	Ckt 1	Ckt 2	Ckt 1	Ckt 2	Ckt 1	Ckt 2
BASIC DATA						
Unit Operating Charge lbs (kg), Note 1	131 (59)	131 (59)	131 (59)	131 (59)	131 (59)	131 (59)
Cabinet Dimensions L x W x H, in. (mm)	187 x 89 x 101 4750 x 2261 x 2565		187 x 89 x 101 4750 x 2261 x 2565		187 x 89 x 101 4750 x 2261 x 2565	
Outdoor Unit Operating Weight, lbs. (kg)	8100 (36770		8952 (4064)		8100 (36770	
Outdoor Unit Shipping Weight, lbs (kg)	8100 (36770		8952 (4064)		8100 (36770	
Add for Copper Fins, lbs (kg)	1276 (579)		1596 (725)		1276 (579)	
COMPRESSORS, SCREW, SEMI-HERMETIC						
Nominal Capacity, tons (kW)	60 (211)	60 (211)	60 (211)	70 (246)	70 (246)	70 (246)
CONDENSERS, HIGH EFFICIENCY FIN AND TUBE TYPE WITH INTEGRAL SUBCOOLER						
Pumpdown Capacity, lbs (kg)	197 (89)	197 (89)	197 (89)	197 (89)	164 (74)	164 (74)
CONDENSER FANS, DIRECT DRIVE PROPELLER TYPE						
No. of Fans – 30 in. Fan Dia.	8		8		8	
No. of Motors -- hp (kW)	8 2 (1.5)		8 2 (1.5)		8 2 (1.5)	
Fan & Motor RPM, 60Hz	1140		1140		1140	
60 Hz Fan Tip Speed, fpm (m/s)	8950 (4224)		8950 (4224)		8950 (4224)	
60 Hz Total Unit Airflow, cfm (l/s)	86900 (41020)		86900 (41020)		86900 (41020)	
REMOTE EVAPORATOR, DIRECT EXPANSION SHELL AND TUBE						
Shell Dia.-Tube Length in.(mm) - in. (mm)	15.5 x 82.4 (394 x 2093)		15.5 x 82.4 (394 x 2093)		15.5 x 82.4 (394 x 2093)	
Operating Weight, lbs (kg)	1282 (562)		1282 (562)		1282 (562)	
Shipping Weight, lbs (kg)	875 (397)		875 (397)		875 (397)	
Evaporator R-134a Charge lbs (kg)	1.95 (0.9)	1.95 (0.9)	1.95 (0.9)	1.95 (0.9)	1.95 (0.9)	1.95 (0.9)
Water Volume, gallons (liters)	49 (185)		49 (185)		49 (185)	
Max. Water Pressure, psi (kPa)	152 (1048)		152 (1048)		152 (1048)	
Max. Refrigerant Press., psi (kPa)	352 (2427)		352 (2427)		352 (2427)	

NOTE: Charge quantity does not include field piping.

Table 38, Physical Data, AGS 160C – AGS 180C (Remote Evaporator)

DATA	AGS MODEL NUMBER					
	160C		170C		180C	
	Ckt. 1	Ckt. 2	Ckt. 1	Ckt. 2	Ckt. 1	Ckt. 2
BASIC DATA						
Unit Operating Charge, lbs (kg)	131 (59)	131 (59)	159 (72)	159 (72)	171 (78)	171 (78)
Cabinet Dim., L x W x H, in. (mm)	187 x 89 x 101 4750 x 2261 x 2565		225 x 89 x 101 5715 x 2261 x 2565		225 x 89 x 101 5715 x 2261 x 2565	
Outdoor Unit Operating Wt, lbs. (kg)	8100 (36770		8952 (4064		8952 (4064	
Outdoor Unit Shipping Wt, lbs (kg)	8100 (36770		8952 (4064		8952 (4064	
Add for Copper Fins, lbs (kg)	1276 (579)		1596 (725)		1596 (725)	
COMPRESSORS, SCREW, SEMI-HERMETIC						
Nominal Capacity, tons (kW)	70 (246)	85 (299)	85 (299)	85 (299)	95 (334)	95 (334)
CONDENSERS, HIGH EFFICIENCY FIN AND TUBE TYPE WITH INTEGRAL SUBCOOLER						
Pumpdown Capacity, lbs (kg)	197 (89)	197 (89)	247 (112)	247 (112)	247 (112)	247 (112)
CONDENSER FANS, DIRECT DRIVE PROPELLER TYPE						
No. of Fans; Fan Dia., in. (mm)	8		10		10	
No. of Motors – hp (kW)	8 2 (1.5)		10 2 (1.5)		10 2 (1.5)	
Fan & Motor RPM, 50Hz	1140		1140		1140	
60 Hz Fan Tip Speed, fpm	8950 (4224)		8950 (4224)		8950 (4224)	
m60 Hz Total Unit Airflow, cfm (l/s)	86900 (41020)		108630 (51280)		108630 (51280)	
REMOTE EVAPORATOR, DIRECT EXPANSION SHELL AND TUBE						
Shell Dia.,Tube Length in.(mm)	19.4 x 82.4 (493 x 2093)		19.4 x 105.1 (493 x 2670)		19.4 x 105.1 (493 x 2670)	
Operating Weight, lbs (kg)	1916 (870)		2283 (1037)		2283 (1037)	
Shipping Weight, lbs (kg)	1224 (556)		1400 (636)		1400 (636)	
Evaporator R-134a Charge lbs (kg)	2.53 (1.1)	2.53 (1.1)	3.16 (1.4)	3.16 (1.4)	3.16 (1.4)	3.16 (1.4)
Water Volume, gallons (liters)	83 (314)		106 (401)		106 (401)	
Max. Water Pressure, psi (kPa)	152 (1048)		152 (1048)		152 (1048)	
Max. Refrigerant Press., psi (kPa)	352 (2427)		352 (2427)		352 (2427)	

Table 39, Physical Data, AGS 190C – AGS 210C (Remote Evaporator)

DATA	AGS 190C		AGS 210C	
	Ckt 1	Ckt 2	Ckt 1	Ckt 2
BASIC DATA				
Unit Operating Charge lbs (kg)	172 (78)	172 (78)	201 (91)	201 (91)
Cabinet Dimensions L x W x H, in. (mm)	225 x 89 x 101 5715 x 2261 x 2565		263 x 89 x 101 6680 x 2261 x 2565	
Unit Shipping Weight, lbs (kg)	8952 (4064)		9571 (4345	
Unit Operating Weight, lbs. (kg)	8952 (4064)		9571 (4345	
Add for Copper Fins, lbs (kg	1596 (725)		1916 (870)	
COMPRESSORS, SCREW, SEMI-HERMETIC				
Nominal Capacity, tons (kW)	95 (334)	95 (334)	95 (334)	95 (334)
CONDENSERS, HIGH EFFICIENCY FIN AND TUBE TYPE WITH INTEGRAL SUBCOOLER				
Pumpdown Capacity, lbs (kg)	247 (112)	247 (112)	296 (134)	296 (134)
CONDENSER FANS, DIRECT DRIVE PROPELLER TYPE				
No. of Fans -- Fan Dia., in. (mm)	10		12	
No. of Motors -- hp (kW)	10 2 (1.5)		12 2.5 (1.9)	
Fan & Motor RPM, 50Hz	1140		1140	
60 Hz Fan Tip Speed, fpm (m/s)	8950 (4224)		8950 (4224)	
60 Hz Total Unit Airflow, cfm (l/s)	108630 (51280)		130360 (61530)	
REMOTE EVAPORATOR, DIRECT EXPANSION SHELL AND TUBE				
Shell Dia.-Tube Length in.(mm) - in. (mm)	19.4 x 105.1 (493 x 2670)		19.4 x 105.1 (493 x 2670)	
Operating Weight, lbs (kg)	2281 (1036)		2281 (1036)	
Shipping Weight, lbs (kg)	1437 (652)		1437 (652)	
Evaporator R-134a Charge lbs (kg)	3.63 (1.6)	3.63 (1.6)	3.63 (1.6)	3.63 (1.6)
Water Volume, gallons (liters)	106 (401)		104 (392)	
Max. Water Pressure, psi (kPa)	152 (1048)		152 (1048)	
Max. Refrigerant Press., psi (kPa)	352 (2427)		352 (2427)	

Physical Data, High Efficiency

Table 40, Physical Data, AGS 125C – AGS 145C (Remote Evaporator)

DATA	125C		135C		145C	
	Ckt 1	Ckt 2	Ckt 1	Ckt 2	Ckt 1	Ckt 2
BASIC DATA						
Unit Operating Charge lbs (kg)	159 (72)	159 (72)	159 (72)	159 (72)	159 (72)	159 (72)
Cabinet Dimensions L x W x H, in. (mm)	225 x 89 x 101 5715 x 2261 x 2565		225 x 89 x 101 5715 x 2261 x 2565		225 x 89 x 101 5715 x 2261 x 2565	
Unit Operating Weight, lbs. (kg)	8952 (4064		8952 (4064		8952 (4064	
Unit Shipping Weight, lbs (kg)	8952 (4064		8952 (4064		8952 (4064	
Add for Copper Fins, lbs (kg	1596 (725)		1596 (725)		1596 (725)	
COMPRESSORS, SCREW, SEMI-HERMETIC						
Nominal Capacity, tons (kW)	60 (211)	60 (211)	60 (211)	70 (246)	70 (246)	70 (246)
CONDENSERS, HIGH EFFICIENCY FIN AND TUBE TYPE WITH INTEGRAL SUBCOOLER						
Pumpdown Capacity, lbs (kg)	247 (112)	247 (112)	247 (112)	247 (112)	247 (112)	247 (112)
CONDENSER FANS, DIRECT DRIVE PROPELLER TYPE						
No. of Fans -- Fan Dia., in. (mm)	10, 30 (762)		10, 30 (762)		10, 30 (762)	
No. of Motors -- hp (kW)	10 2 (1.5)		10 2 (1.5)		10 2 (1.5)	
Fan & Motor RPM, 60Hz	1140		1140		1140	
60 Hz Fan Tip Speed, fpm (m/s)	8950 (4224)		8950 (4224)		8950 (4224)	
60 Hz Total Unit Airflow, cfm (l/s)	108630 (51280)		108630 (51280)		108630 (51280)	
REMOTE EVAPORATOR, DIRECT EXPANSION SHELL AND TUBE						
Shell Dia.-Tube Length in.(mm) - in. (mm)	19.4 x 82.4 (493 x 2093)		19.4 x 82.4 (493 x 2093)		19.4 x 105.1 (493 x 2670)	
Operating Weight, lbs (kg)	1916 (870)		1916 (870)		1525 (692)	
Shipping Weight, lbs (kg)	1224 (556)		1224 (556)		1005 (456)	
Evaporator R-134a Charge lbs (kg)	2.53 (1.1)	2.53 (1.1)	2.53 (1.1)	2.53 (1.1)	2.44 (1.1)	2.44 (1.1)
Water Volume, gallons (liters)	83 (314)		83 (314)		62 (236)	
Max. Water Pressure, psi (kPa)	152 (1048)		152 (1048)		152 (1048)	
Max. Refrigerant Press., psi (kPa)	352 (2427)		352 (2427)		352 (2427)	

Table 41, Physical Data, AGS 165C – AGS 195C (Remote Evaporator)

DATA	AGS MODEL NUMBER					
	165C		175C		195C	
	Ckt 1	Ckt 2	Ckt 1	Ckt 2	Ckt 1	Ckt 2
BASIC DATA						
Unit Operating Charge lbs (kg)	186 (84)	186 (84)	186 (84)	186 (84)	201 (91)	201 (91)
Cabinet Dimensions L x W x H, in. (mm)	263 x 89 x 101 6680 x 2261 x 2565		263 x 89 x 101 6680 x 2261 x 2565		263 x 89 x 101 6680 x 2261 x 2565	
Unit Operating Weight, lbs. (kg)	9571 (4345)		9571 (4345)		9571 (4345)	
Unit Shipping Weight, lbs (kg)	9571 (4345)		9571 (4345)		9571 (4345)	
Add for Copper Fins, lbs (kg	1916 (879)		1916 (879)		1916 (879)	
COMPRESSORS, SCREW, SEMI-HERMETIC						
Nominal Capacity, tons (kW)	70 (246)	85 (299)	85 (299)	85 (299)	95 (334)	95 (334)
CONDENSERS, HIGH EFFICIENCY FIN AND TUBE TYPE WITH INTEGRAL SUBCOOLER						
Pumpdown Capacity, lbs (kg)	296 (134)	296 (134)	296 (134)	296 (134)	296 (134)	296 (134)
CONDENSER FANS, DIRECT DRIVE PROPELLER TYPE						
No. of Fans -- Fan Dia., in. (mm)	12		12		12	
No. of Motors -- hp (kW)	12 2 (1.5)		12 2 (1.5)		12 2 (1.5)	
Fan & Motor RPM, 60Hz	1140		1140		1140	
60 Hz Fan Tip Speed, fpm (m/s)	8950 (4224)		8950 (4224)		8950 (4224)	
60 Hz Total Unit Airflow, cfm (l/s)	130360 (61530)		130360 (61530)		130360 (61530)	
REMOTE EVAPORATOR, DIRECT EXPANSION SHELL AND TUBE						
Shell Dia.-Tube Length in.(mm) - in. (mm)	19.4 x 105.1 (493 x 2670)		19.4 x 105.1 (493 x 2670)		19.4 x 105.1 (493 x 2670)	
Operating Weight, lbs (kg)	2283 (1037)		2283 (1037)		2281 (1036)	
Shipping Weight, lbs (kg)	1400 (636)		1400 (636)		1437 (652)	
Evaporator R-134a Charge lbs (kg)	3.16 (1.4)	3.16 (1.4)	3.16 (1.4)	3.16 (1.4)	3.63 (1.6)	3.63 (1.6)
Water Volume, gallons (liters)	106 (401)		106 (401)		106 (401)	
Max. Water Pressure, psi (kPa)	152 (1048)		152 (1048)		152 (1048)	
Max. Refrigerant Press., psi (kPa)	352 (2427)		352 (2427)		352 (2427)	

Solid State Starters

Solid state starters are standard on all AGS units. A solid state starter uses a silicon-controlled rectifier (SCR) power section to allow a motor to be brought to full speed with a reduced initial voltage that increases to full line voltage over a given time. The McQuay motor starter, custom designed for this specific application, is microprocessor controlled. Along with this starting technique, the motor starter also provides protection for the motor and monitors its load conditions.

The starter offers:

- Solid state design.
- Closed-loop motor current control.
- Programmable motor protection.
- Programmable operating parameters.
- Programmable metering options.

The three-phase starter contains a six-SCR power section with two SCRs per phase connected in inverse parallel. This power section is capable of providing maximum torque per amp throughout the motor's speed-torque curve with minimal motor and starter heating. At the same time, the starter continually monitors the amount of current being delivered to the motor, thus helping to protect the motor from overheating or drawing excessive current. The starter will automatically stop the motor if the line-to-line current is not within acceptable ranges, or if the current is lost in a line. The motor current scaling is set according to the motor size and the specific application. The starter circuitry is contained on a single printed circuit board, which contains all the logic and SCR gate drive circuitry.

Operating messages are displayed on a three-character LED display located in the unit control panel. The LED display on the control card displays:

- Operating messages that indicate the status of the motor and/or starter.
- Operating parameters that are programmed into the starter.
- Fault codes that indicate a problem with the motor application or starter.

Operating Messages

Possible operating messages are as follows:

Message	Meaning
noL	Line voltage is not present.
rdy	Line voltage is present and starter is ready.
acc	Motor is accelerating after a start command has been received.
uts	The motor has achieved full speed.
run	Motor is operating at full speed, and ramp time has expired.
dCL	A Stop command was received and the motor is decelerating with the set deceleration profile.

OL	OL will alternately blink with the normal display on the LED display when motor thermal overload content has reached 90% to 99% of its capacity.
OLL	The motor thermal overload content has reached 100%, and the motor has stopped. The motor cannot be restarted until the overloaded motor has cooled and OLt is displayed.
OLt	The motor thermal overload content has been reduced to 60% or less, and the motor can be restarted.
ena	Passcode protection is enabled.
dis	Passcode is disabled.
oxx	xx = overload thermal content in percentage. Press the Down button to toggle to this display.
cxx	xx = pending fault.
no	Attempted to change a passcode protected parameter without proper security.
…	Three decimal places blink when remote display is active.
Fxx	xx Fault Code

Table 42, Fault Codes

Number	Description	Controlled Stop	Auto Reset
00	No Fault	--	--
01	UTS Time Limit Expired	Y	Y
02	Motor Thermal Overload Trip	Y	N
10	Phase Rotation Error, Not A-B-C	N	Y
12	Low Line Frequency	N	Y
13	High Line Frequency	N	Y
15	Input Power Not Three phase	N	Y
21	Low Line L1-L2 Voltage	Y	Y
22	Low Line L2-L3 Voltage	Y	Y
23	Low Line L3-L1 Voltage	Y	Y
24	High Line L1-L2 Voltage	Y	Y
25	High Line L2-L3 Voltage	Y	Y
26	High Line L3-L1 Voltage	Y	Y
27	Phase loss	N	Y
28	No Line Voltage	N	Y
30	I.O.C. (Instantaneous Overcurrent)	N	N
31	Overcurrent	Y	N
37	Current Imbalance	Y	Y
38	Ground Fault	Y	N
39	No Current At Run	N	Y
40	Shorted/Open SCR	N	N
47	Stack Protection Fault	N	Y
48	Bypass Contactor Fault (on STOP input)	Y	N
50	Control Power Low	N	Y

Continued next page

Number	Description	Controlled Stop	Auto Reset
51	Current Sensor Offset Error	--	N
52	Burden Switch Error	N	N
60	Thermistor Trip	N	N
61	Stack OT Switch Trip	N	N
71	Analog Input Trip	Y	Y
82	Modbus Time-out	Y	Y
94	CPU Error – Software Fault	N	N
95	CPU Error – Parameter Storage Fault	N	N
96	CPU Error – Illegal Instruction Trap	N	N
97	CPU Error – Software Watchdog Fault	N	N
98	CPU Error – Spurious Interrupt N	N	N
99	CPU Error – Program Storage Fault	N	N

Starter Planned Maintenance

During commissioning:

- Torque all power connections during commissioning. This includes factory-wired components.
- Check all of the control wiring in the package for loose connections.

During the first month after the starter has been put in operation:

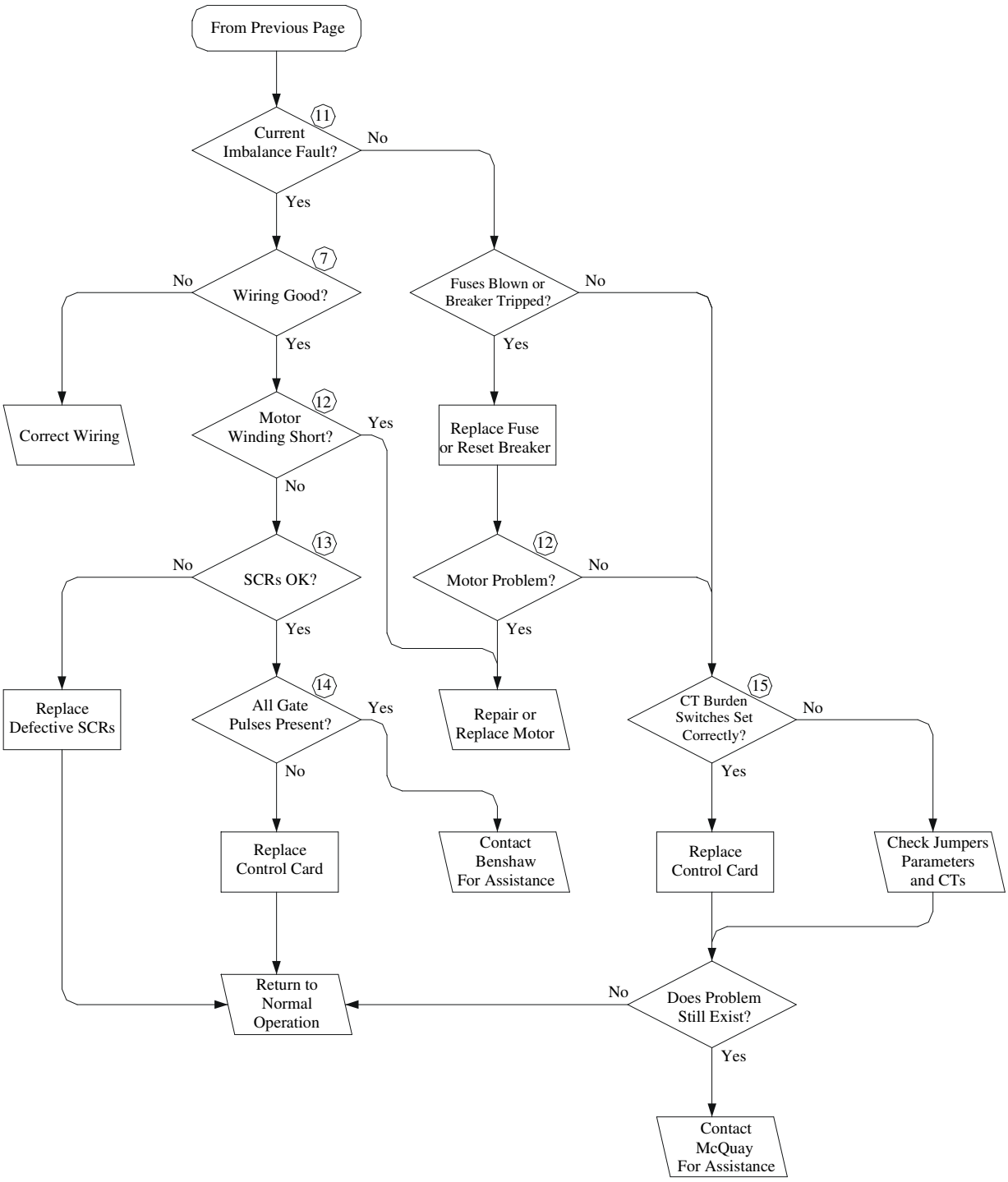
- Re-torque all power connections every two weeks. This includes factory-wired components.
- Inspect cooling fans (if applicable) after two weeks for proper operation.

After the first month of operation:

- Re-torque all power connections every year.
- Clean any accumulated dust from the starter using a clean source of compressed air.
- Inspect the cooling fans every three months for proper operation.
- Clean or replace any air vent filters on the starter every three months.

NOTE: If mechanical vibrations are present at the installation site, inspect the connections more frequently.

Figure 37, Trouble Shooting Guide


From Previous Page
11
Current Imbalance Fault?
No
Yes
7
Wiring Good?
No
Yes
Correct Wiring
12
Motor Winding Short?
Yes
No
13
SCRs OK?
No
Yes
Replace Defective SCRs
14
All Gate Pulses Present?
Yes
No
Replace Control Card
Contact Benshaw For Assistance
Fuses Blown or Breaker Tripped?
No
Yes
Replace Fuse or Reset Breaker
12
Motor Problem?
No
Yes
Repair or Replace Motor
15
CT Burden Switches Set Correctly?
No
Yes
Replace Control Card
Check Jumpers Parameters and CTs
Return to Normal Operation
No
Does Problem Still Exist?
Yes
Contact McQuay For Assistance

FLOW CHART DETAILS:

1.	**Fuses**	Determine if power line fuses have been installed, and if they are operating properly.
2.	**Circuit Breaker**	Determine if the circuit breaker is off, or has tripped and disconnected the line from the starter.
3.	**Power Line Voltage**	Verify that line voltage is present, and that it is the correct voltage.
4.	**Phase Order Fault**	If Fault Codes F1 or F2 are displayed on the control card LED display, exchange any two incoming power line cable connections.
5.	**Heat Sink Switch**	Investigate whether heat sink thermal switch is open.
6.	**Safety Device**	Determine if an equipment protection device attached to the starter is disabling the start command.
7.	**Wiring Connections**	Verify that the wiring connections are correct and that the terminations are tightened.
8.	**Air Temperature**	Investigate whether the air temperature surrounding the heat sink is hot.
9.	**Air Circulation**	Determine if the airflow around the heat sink fins is being restricted, or if a fan has failed.
10.	**Motor Overload**	Determine if the motor's load is too large for the motor size.
11.	**Current Imbalance Fault**	If Fault Codes **F23** or **F24** are displayed on the control card LED display, diagnose and correct the cause of the current imbalance parameter **P16**.
12.	**Motor Winding Problem**	Conducting a megger test of the motor can identify an internal motor winding problem. NOTE: To avoid damaging the starter isolate the motor before conducting the megger test.

⚠ WARNING

Hazardous voltages exist at the starter terminals. Lock out and tag all power sources before making resistance measurements to avoid personal injury or death.

13.	**SCRs**	This step can help determine if a problem exists with the SCRs. Using a multi-meter or similar device, measure the resistance between: • L1 terminal and T1 terminal • L2 terminal and T2 terminal • L3 terminal and T3 terminal The resistance should be more than 50k ohms. Measure the gate resistance between the white and red of each twisted pair (6 total). The gate resistance should be between 8 and 50 ohms.
14.	**Gate Pulses**	This step can help to determine if the control card is functioning properly. Check for gate firing voltage between 0.3 and 1.5 volts when the card is operating.
15.	**Motor Current**	Determine if motor current signal scaling is correct.

Solid State Starter Settings

Operating Parameters Settings for Default Value and Settable Range:

Table 43, Starter Settings

No.	Operating Parameter	Default	Range of Setting
P1	Motor Full Load Amps (FLA)	1A	1 to 9999A
P2	Motor Rated Load Amps (RLA)	1A	1 to 9999A
P3	Motor Service Factor	1.25	1-1.99
P4	Motor Overload Class	10	1-40,Off
P5	Initial Motor Starting Current	225%	50 - 400%
P6	Max. Motor Starting Current	300%	100 – 800%
P7	Motor Ramp Time	7 sec	0 - 300 sec
P8	UTS time	10 sec	1 - 900 sec
P9	Stop Mode	Cos	Coast/Voltage decel
P10	Deceleration Level 1	40%	0 – 100%
P11	Deceleration Level 2	20%	0 – 50%
P12	Deceleration Time	2 sec	1 – 180 sec
P13	Default Meter Display	0(Status)	0-19
P14	Overcurrent Trip Level	140%	Off, 50 to 800%RLA
P15	Overcurrent Trip Time	2 sec	Off, .1 – 90 sec
P16	Rated RMS Voltage	460	100,110,120,200,208,220,230,240,350,380,400,415,440,460,480,500,525,575,600,660,690,1000
P17	Overvoltage Trip Level	10%	Off, 1 – 40% rated volts
P18	Undervoltage Trip Level	10%	Off, 1 – 40% rated volts
P19	Over/Under Voltage Delay Time	1 Sec	.1-90 Sec
P20	Current Imbalance Trip Level	40%	5 - 40%
P21	Controlled Fault Stop	Off	Off, On
P22	Auto Fault Reset Delay Time	60	Off, 1 – 120 sec
P23	CT Ratio	2640	72,96,144,288,864,2640,2880,5760,8000,14400,28800
P24	Control Source	Ter	Terminal/Network
P25	Modbus Address	2	1 - 247
P26	Modbus Baud Rate	19.2 Kbps	1.2,2.4,4.8,9.6,19.2 kbps
P27	Modbus Timeout	1 sec	Off, 1 – 120 sec
P28	Analog Output Function	1	1 - 11
P29	Analog Output Span	100%	1 – 125%
P30	Analog Output Offset	0%	0 – 99%
P31	Passcode		0-9999
P32	Fault Log		Display faults

Major Component Location

Figure 38, Unit Cutaway View

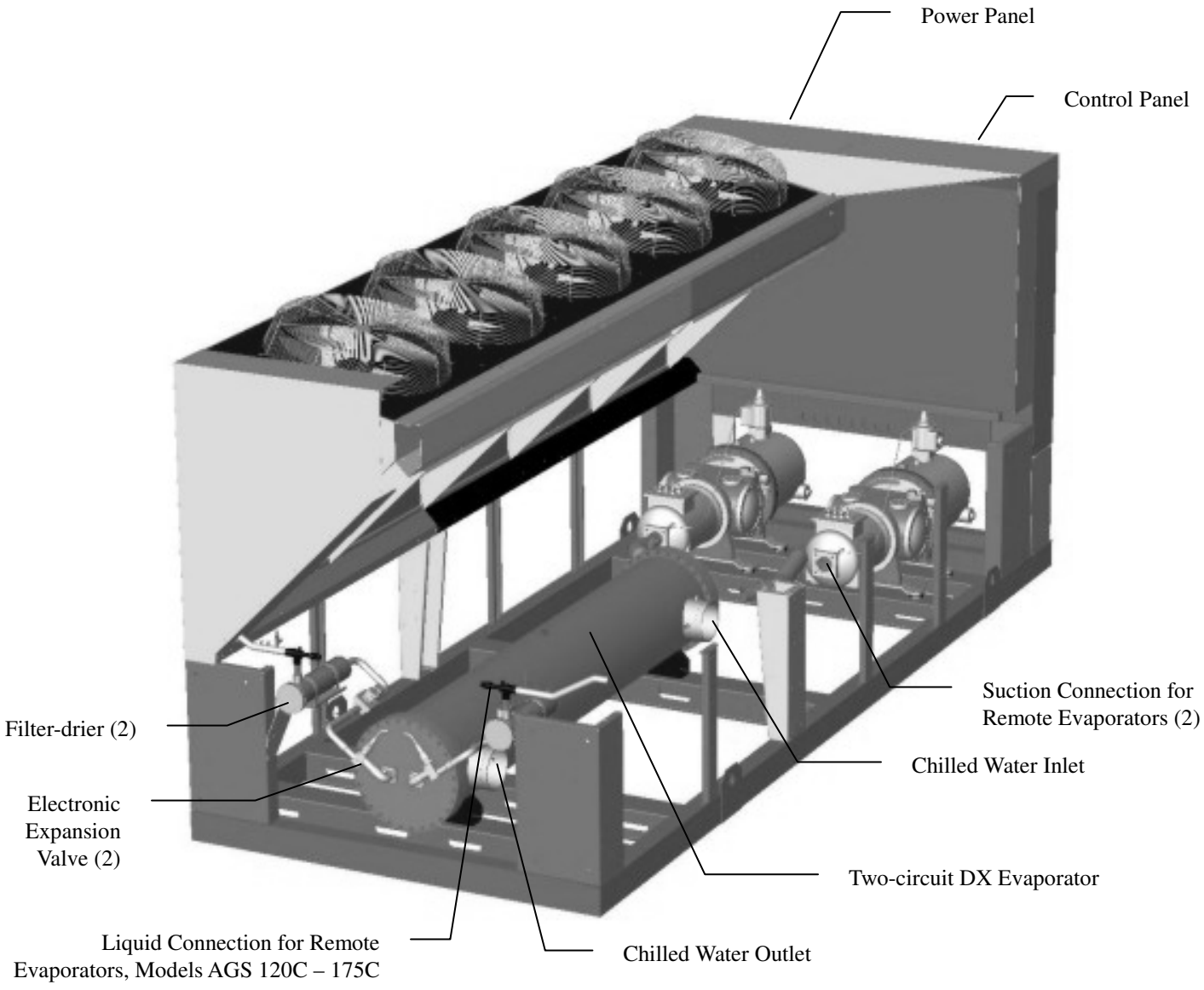
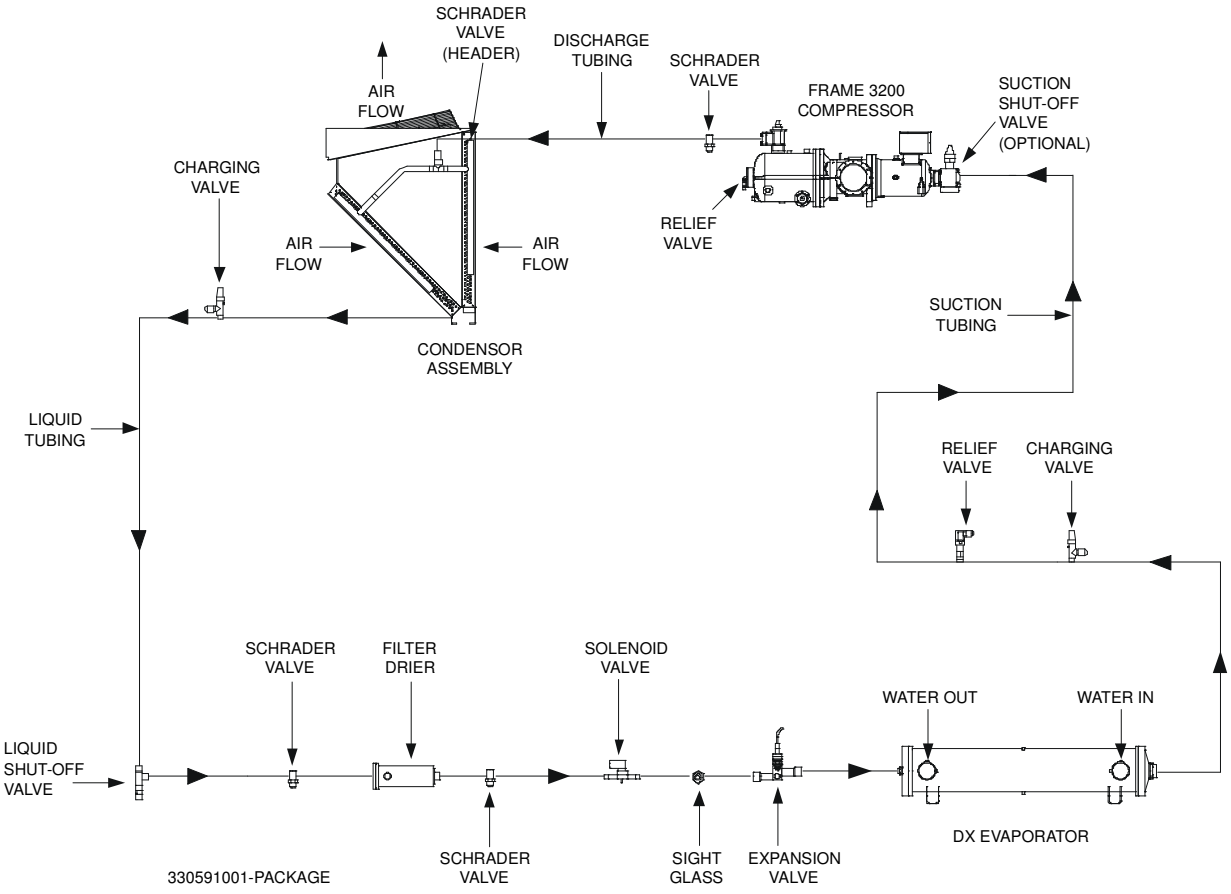


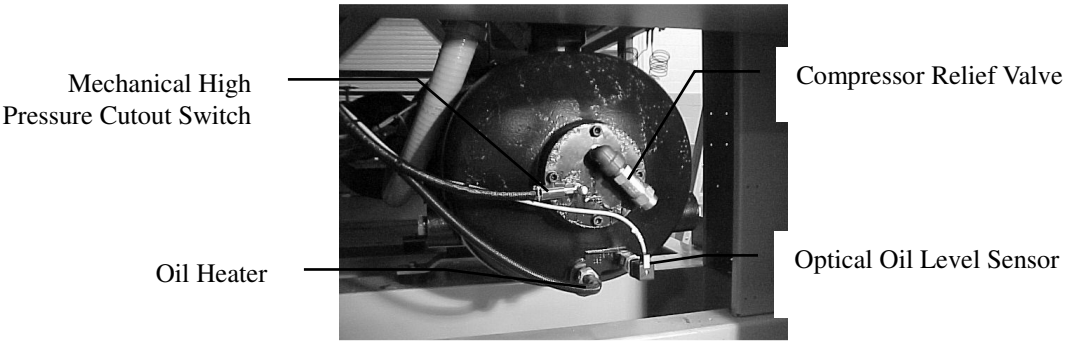
Figure 39, Piping Schematic, One of Two Circuits



The above diagram illustrates one of the two circuits of an AGS chiller. The evaporator has two single-pass circuits with water passing over baffles on the shell side.

The vertical and slanted coils on one side of the unit comprise a condensing circuit. Models AGS 180C through 210C have an external economizer circuit consisting of a brazed-plate heat exchanger and expansion valve (not shown on the above diagram).

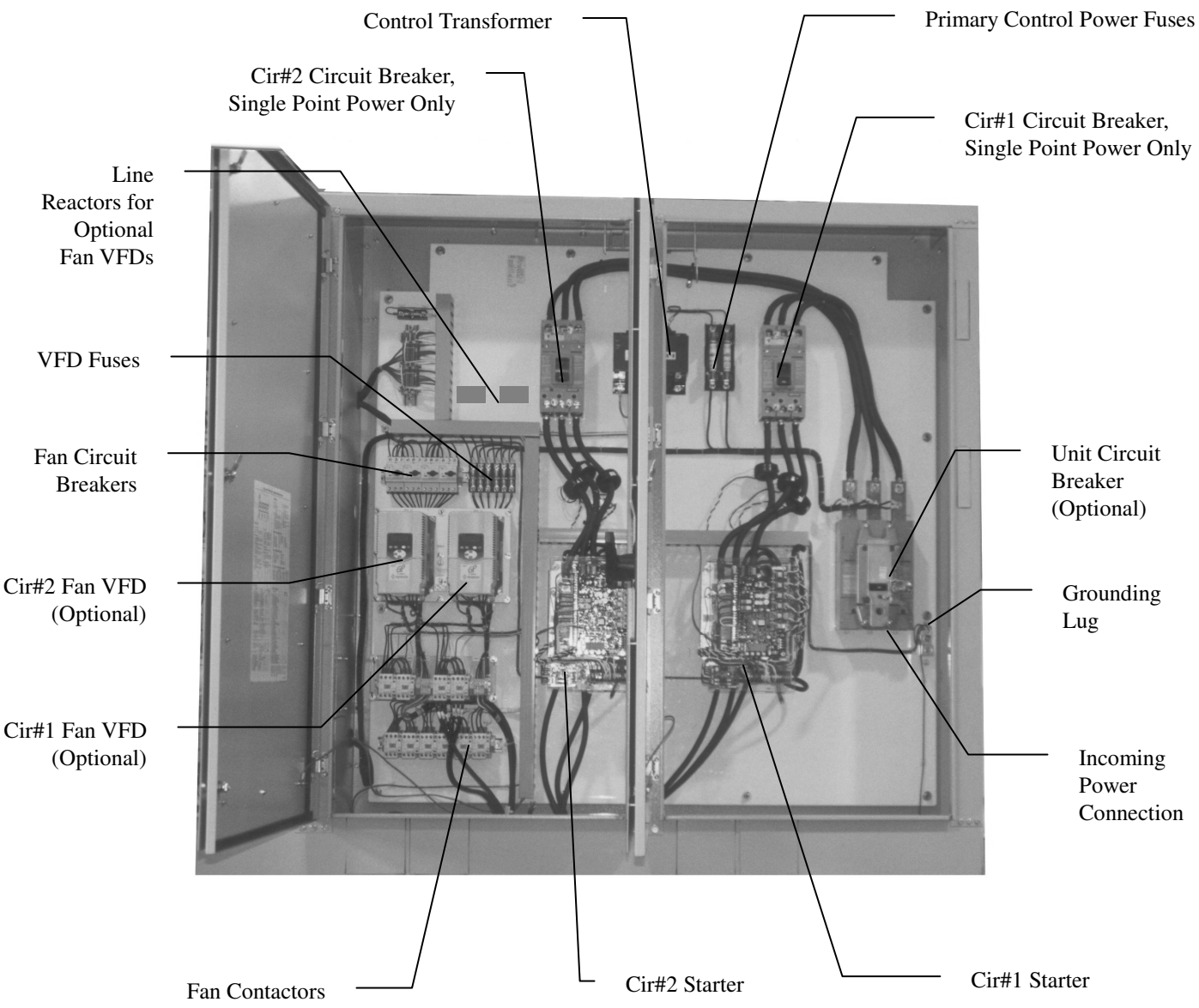
Figure 40, Compressor-mounted Components



Power Panel

The power panel is located on the front of the unit, to the right of the control panel.

Figure 41, Power Panel Components (Single Point Power)

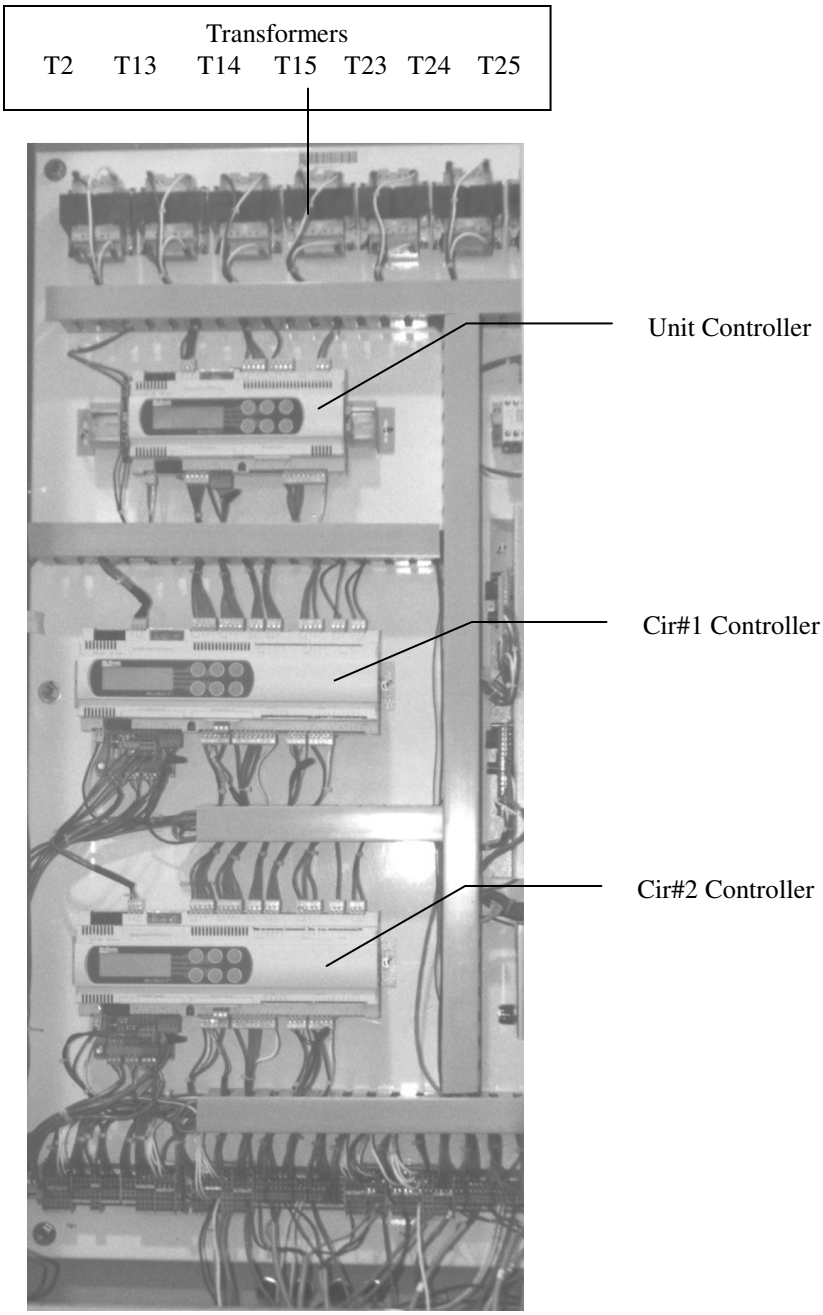


Control Panel

The control panel is located on the front of the unit, to the left of the power panel.

Distributed control architecture enhances unit reliability. Each compressor circuit has its own microprocessor controller so that if one circuit controller is inoperative, the other circuit controller will still be able to run its compressor and circuit components.

Figure 42, Control Panel Components



T2	24V Unit Controller Transformer
T13, T23	24V Circuit Controller Transformers
T14, T24	24V Compressor Load/Unload Trns.
T15, T25	24V EXV Driver Transformer

System Maintenance

General

On initial start-up and periodically during operation, it will be necessary to perform certain routine service checks. Among these are checking the liquid line sight glasses, and the compressor oil level sight glass. In addition, check the MicroTech II controller temperature and pressure readings with gauges and thermometers to see that the unit has normal condensing and suction pressure and superheat and subcooling readings. A recommended maintenance schedule is located at the end of this section.

A Periodic Maintenance Log is located at the end of this manual. It is suggested that the log be copied and a report be completed on a regular basis. The log will serve as a useful tool for a service technician in the event service is required.

Initial start-up date, vibration readings, compressor megger readings and oil analysis information should be kept for reference base-line data.

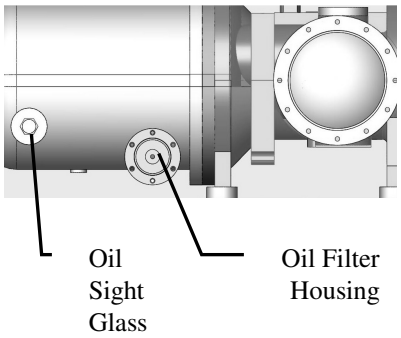
Compressor Maintenance

Since the compressor is semi-hermetic, no yearly compressor maintenance is normally required; however, vibration is an excellent check for proper mechanical operation. Compressor vibration contributes to a decrease in unit performance and efficiency and indicates that maintenance is required. It is recommended that the compressor be checked with a vibration analyzer at, or shortly after, start-up and again on an annual basis. The load should be maintained as closely as possible to the load of the original test and only one compressor should be running at a time. The initial vibration analyzer test provides a benchmark of the compressor and, when performed routinely, can give a warning of impending problems.

Lubrication

No routine lubrication is required on AGS units. The fan motor bearings are permanently lubricated. No further lubrication is required. Excessive fan motor bearing noise is an indication of a potential bearing failure.

Figure 43, Compressor Oil Filter



Compressor oil must be ICI RL68HB, McQuay Part Number 735030446 in a 1-gallon container. This is synthetic polyolester oil with anti-wear additives and is highly hygroscopic. Care must be taken to minimize exposure of the oil to air when charging oil into the system.

The oil filter resides in the compressor housing as shown in Figure 43. Units without a suction service shutoff valve require pumping down the circuit in order to change the filter.

The top of the oil level should be visible in the sight glass. If the glass is completely filled with oil at all times, the circuit is overcharged with oil. If only refrigerant is visible in the glass, the circuit has insufficient oil.

A mechanical oil pressure differential switch is mounted on the unit frame adjacent to each compressor and will shut down the compressor at a differential pressure greater than 25 psi.

The switch has automatic reset but is locked out by the MicroTech II control, which must be reset through the software. A gauge can be put across the switch to actually measure the pressure drop. The normal pressure drop is 5 to 6 psi. Change the filter at 15 psi.

Electrical Terminals

⚠ DANGER

Electric equipment can cause electric shock with a risk of severe personal injury or death. Turn off, lock out and tag all power before continuing with following service. Panels can have more than one power source.

⚠ CAUTION

Periodically check electrical terminals for tightness and tighten as required. Always use a back-up wrench when tightening electrical terminals.

Condensers

The condensers are air-cooled and constructed of 3/8" (9.5mm) OD internally finned copper tubes bonded in a staggered pattern into louvered aluminum fins. No maintenance is ordinarily required except the routine removal of dirt and debris from the outside surface of the fins. McQuay recommends the use of non-caustic, non-acidic, foaming coil cleaners available at most air conditioning supply outlets. Flush the coil from the inside out.

⚠ WARNING

Use caution when applying coil cleaners. They can contain potentially harmful chemicals. Wear breathing apparatus and protective clothing. Thoroughly rinse all surfaces to remove any cleaner residue. Do not damage the fins during cleaning.

If the service technician has reason to believe that the refrigerant circuit contains noncondensables, recovery of the noncondensables will be required, strictly following Clean Air Act regulations governing refrigerant discharge to the atmosphere. The service Schrader valves are located on both vertical coil headers on both sides of the unit at the control box end of the coil. Access panels are located at the end of the condenser coil directly behind the control panel. Recover the noncondensables with the unit off, after shutdown of 15 minutes or longer, to allow air to collect at the top of the coil. Restart and run the unit for a brief period. If necessary, shut the unit off and repeat the procedure. Follow accepted environmentally sound practices when removing refrigerant from the unit.

Liquid Line Sight Glass

Observe the refrigerant sight glasses (one per circuit) weekly. A clear glass of liquid indicates that there is adequate refrigerant charge in the system to provide proper feed through the expansion valve. Bubbling refrigerant in the liquid line sight glass, during stable run conditions, may indicate that there can be an electronic expansion valve (EXV) problem since the EXV regulates liquid subcooling. Refrigerant gas flashing in the sight glass could also indicate an excessive pressure drop in the liquid line, possibly due to a clogged filter-drier or a restriction elsewhere in the liquid line (see page 25 for maximum allowable pressure drops).

An element inside the sight glass indicates the moisture condition corresponding to a given element color. If the sight glass does not indicate a dry condition after about 12 hours of operation, the circuit should be pumped down and the filter-drier changed. An oil acid test is also recommended.

Do not use the sight glass on the EXV body for refrigerant charging. Its purpose is to view the position of the valve.

Lead-Lag

A feature on all McQuay AGS air-cooled chillers is a system for alternating the sequence in which the compressors start to balance the number of starts and run hours. Lead-Lag of the refrigerant circuits is accomplished automatically through the MicroTech II controller. When in the auto mode, the circuit with the fewest number of starts will be started first. If all circuits are operating and a stage down in the number of operating compressors is required, the circuit with the most operating hours will cycle off first. The operator can override the MicroTech II controller, and manually select the lead circuit as circuit #1 or #2.

Preventative Maintenance Schedule

PREVENTATIVE MAINTENANCE SCHEDULE			
OPERATION	WEEKLY	MONTHLY (Note 1)	ANNUAL (Note 2)
General			
Complete unit log and review (Note 3)	X		
Visually inspect unit for loose or damaged components and visible leaks		X	
Inspect thermal insulation for integrity			X
Clean and paint as required			X
Electrical			
Sequence test controls			X
Check contactors for pitting, replace as required			X
Check terminals for tightness, tighten as necessary			X
Clean control panel interior			X
Clean control box fan filter (Note 7)	X		
Visually inspect components for signs of overheating		X	
Verify compressor and oil heater operation		X	
Megger compressor motor			X
Refrigeration/Oil			
Leak test		X	
Check liquid line sight glasses for clear flow	X		
Check compressor oil sight glass for correct level (oil charge)	X		
Check filter-drier pressure drop (see manual for spec)		X	
Check oil filter pressure drop (Note 6)		X	
Perform compressor vibration test			X
Perform oil analysis test on compressor oil			X
Condenser (air-cooled)			
Clean condenser coils (Note 4)			X
Check fan blades for tightness on shaft (Note 5)			X
Check fans for loose rivets and cracks, check motor brackets			X
Check coil fins for damage and straighten as necessary			X

Notes:

1. Monthly operations include all weekly operations.
2. Annual (or spring start-up) operations include all weekly and monthly operations.
3. Log readings can be taken daily for a higher level of unit observation.

4. Coil cleaning can be required more frequently in areas with a high level of airborne particles.
5. Be sure fan motors are electrically locked out.
6. Replace the filter if pressure drop exceeds 20 psi.
7. The weekly fan filter cleaning schedule can be modified to meet job conditions. It is important that the filter allows full air flow.

Warranty Statement

Limited Warranty

McQuay's written Limited Product Warranty, along with any extended warranty expressly purchased is the only warranty. Consult your local McQuay Representative for warranty details. Refer to Form 430285Y. To find your local McQuay Representative, go to www.mcquay.com.

Service

⚠ CAUTION

1. **Service on this equipment must be performed by trained, experienced refrigeration personnel familiar with equipment operation, maintenance, correct servicing procedures, and the safety hazards inherent in this work. Causes for repeated tripping of equipment protection controls must be investigated and corrected.**
2. **Anyone servicing this equipment must comply with EPA requirements regarding refrigerant reclamation and venting.**

⚠ DANGER

Disconnect <u>all</u> power before doing any service inside the unit to avoid bodily injury or death. MULTIPLE POWER SOURCES CAN FEED THE UNIT.

Liquid Line Filter-Driers

Replace the filter-drier cores any time excessive pressure drop is read across the filter-drier and/or when bubbles occur in the sight glass with normal subcooling. There is one, two-core drier in each circuit. Models AGS 180 to 210 have economizers that incorporate an additional filter-drier that should also be checked. The maximum recommended pressure drop across the filter-drier is 7 psi at full load.

The filter-driers should also be changed if the moisture indicating liquid line sight glass indicates excess moisture in the system, or an oil test indicates the presence of acid.

High acid cores may be used temporarily, but replaced after two day use.

The following is the procedure for changing the filter-drier core:

The standard unit pumpdown is set to stop pumpdown when 20 psig (138 kPa) suction pressure is reached. To fully pump down a circuit beyond 20 psig (138 kPa) for service purposes, a "Full Pumpdown" service mode can be activated using the keypad.

With Full Pumpdown = Yes, then the next time the circuit is pumped down, the pumpdown will continue until the evaporator pressure reaches 15 psig (103 kPa) or 120 seconds have elapsed, whichever occurs first. Upon completing the pumpdown, the "FullPumpDwn" setpoint is automatically changed back to "No".

The procedure to perform a full service pumpdown for changing the filter-drier core is as follows:

1. Under the "Alarm Spts", change the "FullPumpDwn" setpoint from "No" to "Yes".
2. Move the circuit switch to the OFF position. The compressor will unload to minimum slide position and the unit will pump down.
3. Upon completing the full pumpdown per step 3, the "FullPumpDwn" setpoint is automatically changed back to "No" which reverts back to standard 20 psig (138 kPa) pumpdown stop pressure.
4. If the pumpdown does not go to 15 psig (103 kPa) on the first attempt, one more attempt can be made by repeating the above steps. Do not repeat "FullPumpDwn" more than once to avoid excessive screw temperature rise under this abnormal condition.
5. The circuit is now in the deepest pumpdown that can be achieved by the use of the compressor. Close the two liquid line shutoff valves upstream of the filter-drier, on the circuit to be serviced plus the optional suction shutoff valve. Manually open the EXV, then remove the remaining refrigerant from the evaporator by the use of a refrigerant recovery unit.
6. Loosen the cover bolts, remove the cap and replace the filters.
7. Evacuate and open valves.

Evacuate the lines through the liquid line manual shutoff valve(s) to remove noncondensables that could have entered during filter replacement. Perform a leak check before returning the unit to operation.

Compressor Slide Valves

The slide valves used for unloading the compressor are hydraulically actuated by pulses from the load/unload solenoid as controlled by the circuit controller. See OM AGS for details on the operation.

Electronic Expansion Valve (EXV)

The electronic expansion valve is located in each circuit's liquid line entering the evaporator.

The expansion valve meters the amount of refrigerant entering the evaporator to match the cooling load. It does this by maintaining constant suction superheat. (Superheat is the difference between the actual refrigerant temperature of the gas as it leaves the evaporator and the saturation temperature corresponding to the evaporating pressure.) The EXV logic controls the superheat between 4°F at 0% slide position and 8°F at 100% slide position.

The position of the valve can be viewed at any time by using the MicroTech II controller keypad through the View Refrigerant menus. There are 6386 steps between closed and full open. There is also a sight glass on the EXV to observe valve movement and to check if it is open or closed visually.

Evaporator

The evaporator is a two-circuit, direct expansion, shell-and-tube type with water flowing through the shell and refrigerant flowing in one pass through the tubes. The tubes are internally enhanced to provide extended heat transfer surface. Normally, no service work is required on the evaporator other than cleaning the water side in the event of improper water treatment or contamination.

Charging Refrigerant

Note:

It is a good idea to record the normal values of refrigerant pressures, subcooling, superheat, and evaporator and condenser approach temperatures during startup by the McQuay service technician. This makes it easier to spot errant unit behavior.

Indications of a low refrigerant R-134a charge:

- Condenser subcoolong approaching 0 degrees F.
- Suction superheat higher than 10 to 12 degrees F.
- Bubbles in the sight glass.

Indications of a high refrigerant R-134a charge:

- Condenser pressure is abnormally high.
- Subcooling is abnormally high. Take note of the subcooling on the unit at startup and use this value as a benchmark.
- EXV is at minimum position and discharge superheat is low (below 22 degrees F). The circuit controller View Refrigerant Screen #7 displays the valve position and the valve range. The minimum position occurs when the valve position value remains at the lower limit of the range displayed.

AGS air-cooled screw compressor chillers are shipped factory-charged with a full operating charge of refrigerant; but there can be times when a unit must be recharged at the job site. Follow these recommendations when field charging. Refer to the unit operating charge found in the Physical Data Tables beginning on page 26 for packaged units and page 60 for remote evaporator units. An initial charge of 80% to 90% of the nameplate is assumed. Unit charge adjustment should be done at 100% load, at normal cooling outdoor temperature (preferably higher than 75°F (24°C), and with all fans on. Unit must be allowed to run 15 minutes or longer so that the condenser fan staging and load is stabilized at normal operating discharge pressure. For best results, charge with condenser pressure at design conditions.

Each circuit of the evaporator has a sight glass located in the liquid line. If the unit can be run at close to ARI conditions (95°F ambient temperature and 44°F chilled water), there should be no bubbles in the sight glass, but this does not necessarily mean that the unit is correctly charged. Charge until the superheat and subcooling temperatures are within range. The discharge superheat should be above 22 degrees F.

Procedure to charge an undercharged AGS unit:

1. If a unit is low on refrigerant, first determine the cause before attempting to recharge the unit. Locate and repair any refrigerant leak. Evidence of oil is a good indicator of leakage. However, oil may not be visible at all leaks. Liquid leak detector fluids work well to show bubbles at medium size leaks, but electronic leak detectors can be needed to locate small leaks. Do not use oil/refrigerant detection additives.
2. Add the charge to the system only through the evaporator charging valve.
3. The charge must be added at the 100% slide valve position and above conditions.

4. Add sufficient charge to clear the conditions listed above under “Indications of a low refrigerant R-134a charge”.
5. Overcharging of refrigerant will raise the condenser pressure and increase the condenser subcooling.

Standard Controls

NOTE: A complete explanation of the MicroTech II controller and unit operation is contained in the Operation Manual OM AGS.

Thermistor sensors

Evaporator leaving water temperature - This sensor is located on the evaporator water outlet connection and is used for capacity control of the chiller and low water temperature freeze protection.

Evaporator entering water temperature - This sensor is located on the evaporator water inlet connection and is used for monitoring purposes and return water temperature reset control.

Evaporator pressure transducer circuit #1, 2 - This sensor is located on the suction side of the compressor (evaporator outlet) and is used to determine saturated suction refrigerant pressure and temperature. It also provides low pressure freeze protection.

Condenser pressure transducer circuit #1, 2 - the sensor is located in the discharge line and is used to read discharge pressure and saturated refrigerant temperature (calculated). The transducer will signal the controller to hold load or unload the compressor if a rise in head pressure occurs which is outside the MicroTech II controller setpoint limits. The signal is also used in the calculation of discharge superheat.

Liquid pressure transducer #1, 2 – located on the liquid line ahead of the EXV. It is used to determine liquid pressure and subcooling and is used to control the EXV.

Outside air - This sensor is located on the back of the control box. It measures the outside air temperature, is used to determine if low ambient start logic is necessary, and can be the reference for low ambient temperature lockout.

Suction temperature circuit #1, 2 - The sensor is located in a well on the suction line. The purpose of the sensor is to measure refrigerant temperature and superheat.

Discharge line temperature circuit #1, 2 - The sensor is located in a well on the discharge line. It measures the refrigerant temperature and is used to calculate discharge superheat.

Demand limit - This requires a field connection of a 4-20 milliamp DC signal from an external source such as a building automation system. It will determine the maximum number of cooling stages that can be energized.

Evaporator water temperature reset - This requires a 4-20 milliamp DC signal from a building automation system or temperature transmitter to reset the leaving chilled water setpoint.

High condenser pressure control

MicroTech II control is equipped with high pressure transducers on each refrigerant circuit. The main purpose of the high pressure transducer is to maintain proper head pressure control. It also sends a signal to the MicroTech II control to unload the compressor in the event of an excessive rise in discharge pressure to 275 psig (1896 kPa). Also, MicroTech II control will inhibit additional circuit loading at 267 psig (1841 kPa). The high pressure switch trip setting is 282 psig (1944 kPa). The high pressure alarm is in response to the signal sent by the pressure transducer.

Mechanical high pressure equipment protection control

The high pressure equipment protection control is a single pole, pressure-activated switch that opens on a pressure rise. When the switch opens, the control circuit is de-energized, dropping power to the compressor and fan motor contactors. The switch is factory set (non-adjustable) to open at 310 psig (2137 kPa) ±7 psig and reclose at 200 psig (1379 kPa) ±7 psig. Although the high pressure switch will close again at 200 psig (1379 kPa), the control circuit will remain locked out and it must be reset through the MicroTech II control.

The control is mounted on the rear of the compressor. See page 71.

Compressor motor protection

The compressors are supplied with two types of motor protection. Solid state electronic overloads mounted in the control box sense motor current to within 2% of the operating amps. The MUST TRIP amps are equal to 140% of unit nameplate compressor RLA. The MUST HOLD amps are equal to 125% of unit nameplate RLA. A trip of these overloads can result from the unit operating outside of normal conditions. Repeat overload trips under normal operation can indicate wiring or compressor motor problems. The overloads are manual reset and must be reset at the overload, as well as through the MicroTech II controller.

The compressors also have a solid state Guardister™ circuit that provides motor over temperature protection. The Guardister circuit has automatic reset and gives a Starter Fault (F75) that is cleared through the starter display and must also be reset through the MicroTech II control.

Head pressure control (standard)

The MicroTech II controller automatically cycles the condenser fans in response to condenser pressure. Each fan in a circuit is cycled independently for 4, 5 or 6 steps per circuit, depending on the unit size. This maintains head pressure and allows the unit to run at ambient air temperatures down to 35°F (1.7°C). The settings are adjustable through the controller.

Each fan added has a decreasing percentage effect, so the control pressure band is smaller when more fans are on and largest with only one or two fans on.

Unit operation with the standard control is satisfactory down to outdoor temperatures of 35°F (-1.7°C). Below this temperature, the VFD option is required to regulate the speed of the first fan on the circuit to adequately control the discharge pressure. The VFD option allows unit operation to 0°F (-17.8°C) outdoor temperature, assuming no greater than 5-mph wind.

Head pressure control (optional low ambient)

The optional low ambient control includes a variable frequency drive (VFD) on the first fan on each circuit. The remaining fans cycle based on discharge pressure. This control must be used for operation in ambient temperatures below 35°F (1.7°C) down to 0°F (-17.8°C).

NOTE: VFD and standard fan cycling will provide proper operating refrigerant discharge pressures at the ambient temperatures listed for them, provided the coil is not affected by the existence of wind. Louvers must be utilized for low ambient operation if the unit is subjected to winds greater than 5 mph.

Compressor short cycling protection

The MicroTech II controller contains logic to prevent rapid compressor restarting. Excessive compressor starts can be hard on starting components and create excessive motor winding temperatures. The anti-cycle timers are set for a five-minute stop-to-start cycle and a 20-minute start-to-start cycle. Both are adjustable through the MicroTech II control.

Controls, Settings and Functions

Table 44, Controls

DESCRIPTION	FUNCTION	SYMBOL	SETTING	RESET	LOCATION
Compressor Heaters	To provide heat to drive off liquid refrigerant when compressor is off.	HTR1-COMPR	On, when compressor is off.	N/A	On the Compressor
Compressor Solenoid - Load	Loads compressor	LOAD	N/A	N/A	On the Compressor
Compressor Solenoid - Unload	Unloads the compressor	UNLOAD	N/A	N/A	On the Compressor
Evaporator Heaters	Help prevent evaporator freeze-up	HTR-EVAP	38°F (3.3°C)	N/A	Evap. Barrel
Electronic Expansion Valve Board	To provide power and step control to the EXV stepper motors commanded by the MT II.	EXV-DRIVER	N/A	N/A	Control Panel
Electronic Expansion Valve	To provide efficient unit refrigerant flow and control subcooling.	EXV	In Controller Code	N/A	In Main Liquid Line
Solid State Starter Thermistor Card	To provide motor temperature protection at about 220°F (104°C).	K2 Fault	None, Inherent in design	Auto	Power Panel
Mechanical High High Pressure Switch	For UL, ETL, etc., safety code to prevent high pressure above the relief valve.	MHPR	Refer to OM AGS	Auto	Control Panel
MicroTech II Unit Controller	To control unit functions. Refer to OM AGS.	UNIT CONTROLLER	N/A	Refer to OM AGS	Control Panel
MicroTech II Circuit Controllers	To control individual circuit functions. One per circuit. Refer to OM AGS.	CIRCUIT CONTROLLER	N/A	Refer to OM AGS	Control Panel
Oil Level Sensor	Senses oil level in compressor	OLS	NC with oil present	N/A	On compressor
Fan VFD (Optional)	Controls discharge pressure	FAN VFD	In controller code	N/A	Power Panel
Control Panel Heater	Maintain controller operation	HTR-CONTROL BOX	On at 40°F	N/A	Control Panel
Lightning Arrestor	To protect from high voltage spikes and surges.	LA	N/A	N/A	Power Panel
High Oil Delta-P Switch	Protects compressor from running with insufficient oil pressure	LPS	Refer to OM AGS	Auto	

Troubleshooting Chart

Table 45, Troubleshooting

PROBLEM	POSSIBLE CAUSES	POSSIBLE CORRECTIVE STEPS
Compressor will not run.	1. Main power switch open. 2. Unit S1 system switch open. 3. Circuit switch, CS in pumpdown position. 4. Chilled water flow switch not closed. 5. Circuit breakers open. 6. Fuse blown or circuit breakers tripped. 7. Compressor overload tripped. 8. Defective compressor contactor or contactor coil. 9. System shut down by protection devices. 10. No cooling required. 11. Motor electrical trouble. 12. Loose wiring.	1. Close switch. 2. Check unit status on MicroTech II display. Close switch. 3. Check circuit status on MicroTech II display. Close switch. Check pump operation for flow. 4. Check unit status on MicroTech display. Close switch. 5. Close circuit breakers. 6. Check electrical circuits and motor windings for shorts or grounds. Investigate for possible overloading. Check for loose or corroded connections. Reset breakers or replace fuses after fault is corrected. 7. Overloads are manual reset. Reset overload at button on overload. Clear alarm on MicroTech II display. 8. Check wiring. Repair or replace contactor. 9. Determine type and cause of shutdown and correct problem before attempting to restart. 10. Check control settings. Wait until unit calls for cooling. 11. See 6,7,8 above. 12. Check circuits for voltage at required points. Tighten all power wiring terminals.
Compressor Noisy or Vibrating	1. Compressor Internal problem. 2. Oil injection not adequate.	1. Contact McQuayService. 2. Check that oil sight glass has oil visible during steady operation Check pressure drop across oil filter and oil separator sight glasses
Compressor Overload K2 Tripped or Circuit Breaker Trip or Fuses Blown	1. Low voltage during high load condition. 2. Loose power wiring. 3. Power line fault causing unbalanced voltage. 4. Defective or grounded wiring in the motor. 5. High discharge pressure.	1. Check supply voltage for excessive voltage drop. 2. Check and tighten all connections. 3. Check supply voltage. 4. Check motor and replace if defective. 5. See corrective steps for high discharge pressure.
Compressor Will Not Load or Unload	1. Defective capacity control solenoids. 2. Unloader mechanism defective.	1. Check solenoids for proper operation. See capacity control section. 2. Contact McQuayService .
High Discharge Pressure	1. Noncondensables in the system. 2. Fans not running. 3. Fan control out of adjustment. 4. System overcharged with refrigerant. 5. Dirty condenser coil. 6. Air recirculation from fan outlet into unit coils. 7. Air restriction into unit.	1. Remove noncondensables from the condenser coil after shutdown per EPA regulations. 2. Check fan fuses and electrical circuits. 3. Check that fan setup in the controller matches unit fan number. Check MicroTech II condenser pressure sensor for proper operation. 4. Check discharge superheat and condenser subcooling. Remove the excess charge. 5. Clean the condenser coil. 6. Remove the cause of recirculation. 7. Remove obstructions near unit.
Low Discharge Pressure	1. Wind effect or a low ambient temperature. 2. Condenser fan control not correct. 3. Low suction pressure. 4. Compressor operating unloaded.	1. Protect unit against excessive wind into vertical coils. 2. Check that fan setup in the MicroTech II controller matches unit fan number. Check VFD fan on units with VFD option. 3. See corrective steps for low suction pressure. 4. See corrective steps for failure to load.
Low Suction Pressure	1. Inadequate refrigerant charge quantity. 2. Clogged liquid line filter-drier. 3. Expansion valve malfunctioning. 4. Insufficient water flow to evaporator. 5. Water temperature leaving evaporator is too low. 6. Evaporator tubes fouled. 7. Suction valve (partially) closed. 8. Glycol in chilled water system	1. Check liquid line sight glass. Check unit for leaks. Repair and recharge to clear sight glass at full load, all fans on, 75°F min OAT.. 2. Check pressure drop across the filter-drier. Replace filter-driers. 3. Check expansion valve superheat and valve opening position. Replace valve only if certain valve is not working. 4. Check water pressure drop across the evaporator and adjust gpm. 5. Adjust water temperature to higher value. 6. Inspect by removing water piping. Clean chemically. 7. Open valve. 8. Check glycol concentration
Low Oil Level Trip	1. Insufficient oil. 2. Low discharge pressure.	1. Check oil line and separator sight glasses. 2. Faulty EXV.
High Suction Pressure	1. Excessive load - high water temperature. 2. Compressor unloaders not loading compressor. 3. Superheat is too low. 4. System overcharged	1. Reduce load or add additional equipment. 2. See corrective steps below for failure of compressor to load. 3. Check superheat on MicroTech II display. Check suction line sensor installation and sensor. 4. Check charge, an overcharge raises suction pressure

Periodic Maintenance Log

Date of inspection:_____ Address:_____

Facility/job name: _____ City/State:_____

Unit model number: _____ Physical location of unit:_____

Unit serial number: _____ Service technical (name):_____

Software identification:

Operating hours: Compressor #1_____ Compressor #2_____

Number of starts Compressor #1_____ Compressor #2_____

Follow up service required: Yes ☐ No ☐

General Actions to be Taken

Upper part of report completed: Yes ☐ No ☐ Fill in above

Compressor operation:	Yes	No	Explain all "No" checks
1. Mechanical operation acceptable (noise, vibration, etc.)?	☐	☐	
2. Look at cycling and cooling, is unit controlling at set points?	☐	☐	
3. No refrigerant leaks (full liquid sight glass)?	☐	☐	
4. Liquid line moisture indicator shows dry system?	☐	☐	
5. Proper condensing fan operation?	☐	☐	
6. Condenser coil clean?	☐	☐	
7. No corrosion or paint problems?	☐	☐	
Compressor electrical operation:			
8. Satisfactory electrical operation?	☐	☐	
9. MicroTech II hardware operation satisfactory?	☐	☐	
10. MicroTech II software operation satisfactory?	☐	☐	

Data from MicroTech II Controller:

11. Unit status_____%
12. Circuit status 1 % Capacity Circuit status 2 % Capacity
13. Water temperature – Evaporator: Entering/Leaving _____/_____

	Circuit #1	Circuit #2
14. No. of fan states active:		
15. Evaporator pressure:		
16. Condenser pressure:		
17. EXV position – Steps open or percent open:		
18. Superheat:		
19. Subcooling:		
20. Liquid line temperature:		
21. Outside air temperature:		
22. Leaving evaporator setpoint temperature:		

23. Reset option programmed? Yes ☐ No ☐ Ice storage unit? Yes ☐ No ☐
24. Is VFD included? Yes ☐ No ☐ VFD operation OK? Yes ☐ No ☐
25. Current alarm: ___ ___ ___ Circuit #1 _____ Circuit #2 _____
26. Previous alarm – Show all:

		Alarm Type	Date
	Circuit #1		
	Circuit #2		

27. Compressor starts See note 1 Circuit #1 _____ Circuit #2 _____
28. Compressor run hours Circuit #1 _____ Circuit #2 _____

Data at Job Site:

29. Volts: L1_____ L2_____ L3_____
30. Amps: Comp #1 Ph 1____ PH 2____ PH 3____
31. Amps: Comp #2 PH 1____ PH 2____ PH 3____
32. Vibration – Read every six months using IRD (or equal) unfiltered at flat on top of motor end: _____ In/Sec Comp #1
_____ In/Sec Comp #2

NOTE 1: If the number of starts exceeds the number of run hours, the unit is short cycling. This must be corrected as it can reduce compressor life.

This document contains the most current product information as of this printing. For the most up-to-date product information, please go to **www.mcquay.com**