LENNOX Industries Inc.

INSTALLATION INSTRUCTIONS

December 1965 500,222M

Supersdes 500,154M

Litho U.S.A.

COMBINATION HEATING AND COOLING EQUIPMENT

GCS1 SERIES UNITS

INSTALLATION INSTRUCTIONS FOR
UNITS HAVING THE FOLLOWING BASIC MODEL NUMBERS GCS1-261-60, GCS1-261-90, GCS1-411-90-1, GCS1-413-90-1, GCS1-411-120-1, GCS1-413-120-1, GCS1-651-150 AND GCS1-653-150

NOTE: Attached to this unit is a unit identification plate (i. d. plate). This plate carries a unit identification number which is to be used for servicing or replacement parts only. The i. d. plate is separate from and a supplement to the A. G. A. rating plate.

I-SHIPPING AND PACKING LIST:

Package 1 of 1 Contains:

1-Completely assembled unit with the following parts packed inside:
1-Rain cap
1-Installation Instruction
1-Thermostat

II-SHIPPING DAMAGE:

Check unit for shipping damage. The receiving party should contact the last carrier immediately if any shipping damage is found.

III-GENERAL:

These instructions are only intended as a general guide and do not supersede local codes in any way. Authorities having jurisdiction should be consulted before installation.

IV-REQUIREMENTS:

This unit is designed for outdoor installations only.
Install and wire in accordance with the regulations of the National Board of Fire Underwriters', American Gas Association and local governing bodies. This unit is A. G. A. and C. G. A. approved for the clearances to combustible materials as listed on the unit nameplate.
The electrical power supply to this unit must be on a separate, fused and permanently live electrical circuit.
This unit is not suitable for conventional venting system.
The flue and venting for the unit is complete and no alterations or adjustments should be made.
These units are A. G. A. approved, and may be adjusted for the following temperature rises.

UNIT	°TEMPERATURE
GCS1-261-60	45 to 75
GCS1-261-90	70 to 100
GCS1-411-90-1	45 to 75
GCS1-413-90-1	45 to 75
GCS1-411-120-1	70 to 100
GCS1-413-120-1	70 to 100
GCS1-651-150	45 to 75
GCS1-653-150	45 to 75

V-SETTING THE UNIT:

Use a sound absorbing material (such as Isomode) under the unit if it is installed in a position or location that will transmit sound or vibration to the living area or to adjacent buildings. UNIT MUST BE LEVEL.

NOTE: Make sure the unit is setting so the drain holes in the cooling compartment are not blocked or plugged.

A-Slab Mounting

When this unit is located on the ground outdoors, install on a level concrete slab high enough above the grade to allow adequate drainage of water. Position the top of the slab at least 4" above the grade. This slab should be so located that there is no runoff of water, from higher ground, that can collect around the unit. It is further recommended that an apron of gravel or concrete extend at least 12 inches in front of the condenser air intake.
A minimum of 4 feet should be provided on the outdoor coil air outlet side and any building wall, fence or vertical structures to prevent recirculating hot discharge air. There should

be a minimum of 3 feet clearance on the service access side.

Provide two openings for supply and return air ducts in the foundation or building wall sized as shown in Figure 1.

For ease in installation, we recommend that two correctly sized stub ducts be installed (with the outdoor portion insulated) on the indoor supply and return openings. Provide ducts long enough to make connections to ductwork on the inside of the building. Install unit and stub ducts as shown in Figure 2.

Seal around these ducts using caulking compound or other preferred methods.

B-Rooftop Mounting

Extreme care must be taken when hoisting and handling these units in Rooftop applications to prevent damage to the unit. Hoist the unit onto the roof while it is still in the shipping crate.

When the unit is installed on a roof, locate the condenser inlet facing the prevailing wind. Also, install the unit a minimum of 4" above the roof. Make sure the weight of the unit is properly distributed over roof joists and rafters. 4 x 4 redwood or steel supports are recommended.

VI-FILTERS:

This unit is equipped with frame type filters. If it is desired for easier access to the filters, the filters can be installed in the return air duct to the unit.

VII-CONNECT SUPPLY AND RETURN AIR DUCTS:

Connect the supply and return air ducts to the unit or stub ducts as desired.

VIII-CONNECT DRAIN:

The evaporator coil drain pan is equipped with a 3/4" male pipe nipple. See Figure 3. Connect either a 3/4" flexible hose or 3/4" pipe to this drain outlet and pitch the drain downward to an open drain or sump. Never connect drain to a closed system.

IX-INSTALL GAS PIPING:

Before connecting piping, check with the gas company or authorities having jurisdiction for local codes and requirements.

NOTE: Maximum allowable gas pressure to the unit is 15" W. C. If gas pressure exceeds this amount, use a pressure reducing valve in the gas line.

When connecting the gas supply, the length of the run from the meter must be considered in determining the pipe size to avoid excessive pressure drop. A drip leg should be installed in any vertical section of the pipe line.

In some localities, codes may require that a manual main shutoff valve and ground joint union (furnished by the installer) be installed externally to the cabinet. If this is the case, install the manual main valve and union in the gas line outside the unit, then finish connecting the piping to the controls.

On propane units, compounds used on threaded joints of gas piping shall be resistant to the action of propane gas.

Carefully check all piping connections for gas leaks. Use a soap solution or other preferred means. DO NOT USE MATCHES, CANDLES, FLAME OR OTHER SOURCES OF IGNITION TO CHECK FOR GAS LEAKS.

X-ELECTRICAL CONNECTIONS:

The wiring diagram furnished with this unit will carry the unit number as listed on the unit identification plate.

Remove the control box cover. See Figure 4. Connect line voltage power supply to the unit from the correctly sized disconnect switch. When unit is installed on a roof, mount a weatherproof disconnect switch on the unit. Refer to the wiring diagram furnished on the inside of the control box cover and in these instructions.

Refer to Table 2 for the properly sized disconnect, fusetrons and wires. Only cartridge type fusetrons should be used. If a circuit breaker is installed, use the next larger size.

NOTE: DO NOT CLOSE DISCONNECT SWITCH OR APPLY POWER TO THIS UNIT UNTIL ADVISED TO DO SO BY THESE INSTRUCTIONS.

Install thermostat in the conditioned area where it will not be affected by sunlight drafts or vibration. A position approximately five feet from the floor of the conditioned area near the center of the structure is desirable. Do not install thermostat on an outside wall. Connect low voltage wiring to thermostat and unit. Refer to the wiring diagram furnished on the inside of the control box cover and in these instructions. Set adjustable heat anticipation on thermostat according to thermostat tag furnished with unit.

This unit is furnished with a ground clamp. Ground unit with a suitable ground connection.

XI-START-UP AND ADJUSTMENTS (COOLING CYCLE):

A-Attachment of Gauge Manifold

1- Attach gauge manifold high pressure gauge hose to Schrader fitting on compressor discharge service valve using a Superior no. 895 Unseating Quick Coupler.
2- Attach gauge manifold low pressure gauge hose to Schrader fitting on compressor suction service valve using Superior no. 895 Unseating Quick Coupler.

NOTE: On the GCS1-261-60 and GCS1-261-90 units, the compressor suction service valve is equipped with a gauge port instead of a Schrader fitting. Do not use an Unseating Quick Coupler on this fitting.

3- Purge gauge manifold and lines with refrigerant.

B-Start-Up Procedure

1- Inspect all blower, fan and motor bearings for proper lubrication.
2- Inspect any fan pulleys for alignments, set screws for tightness and belts for proper tension.
3- Check compressor mountings, when external springs are used, for proper adjustment. Tighten hold down nuts just so the compressor will float freely, but without excessive movement.

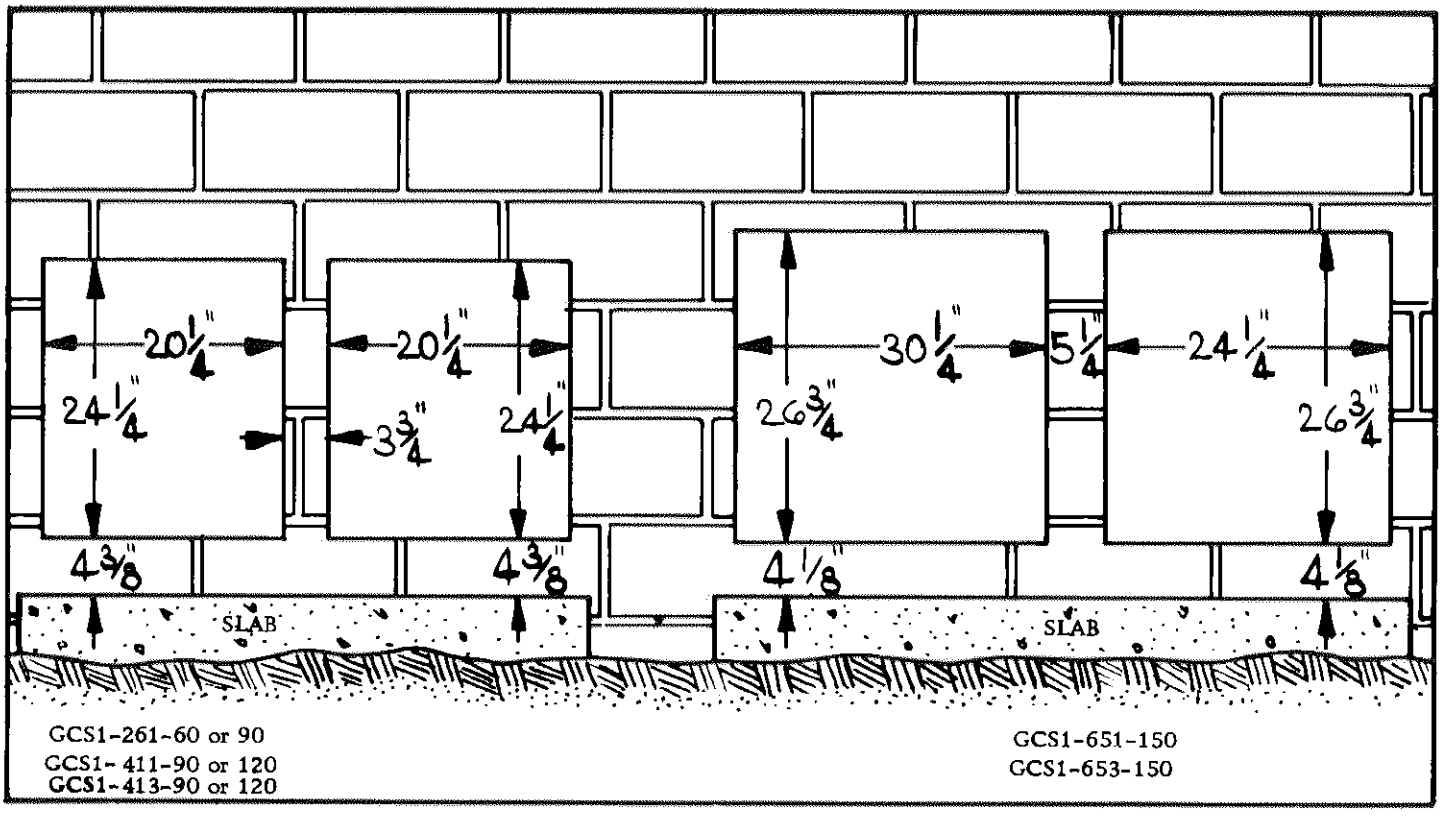


FIGURE 1

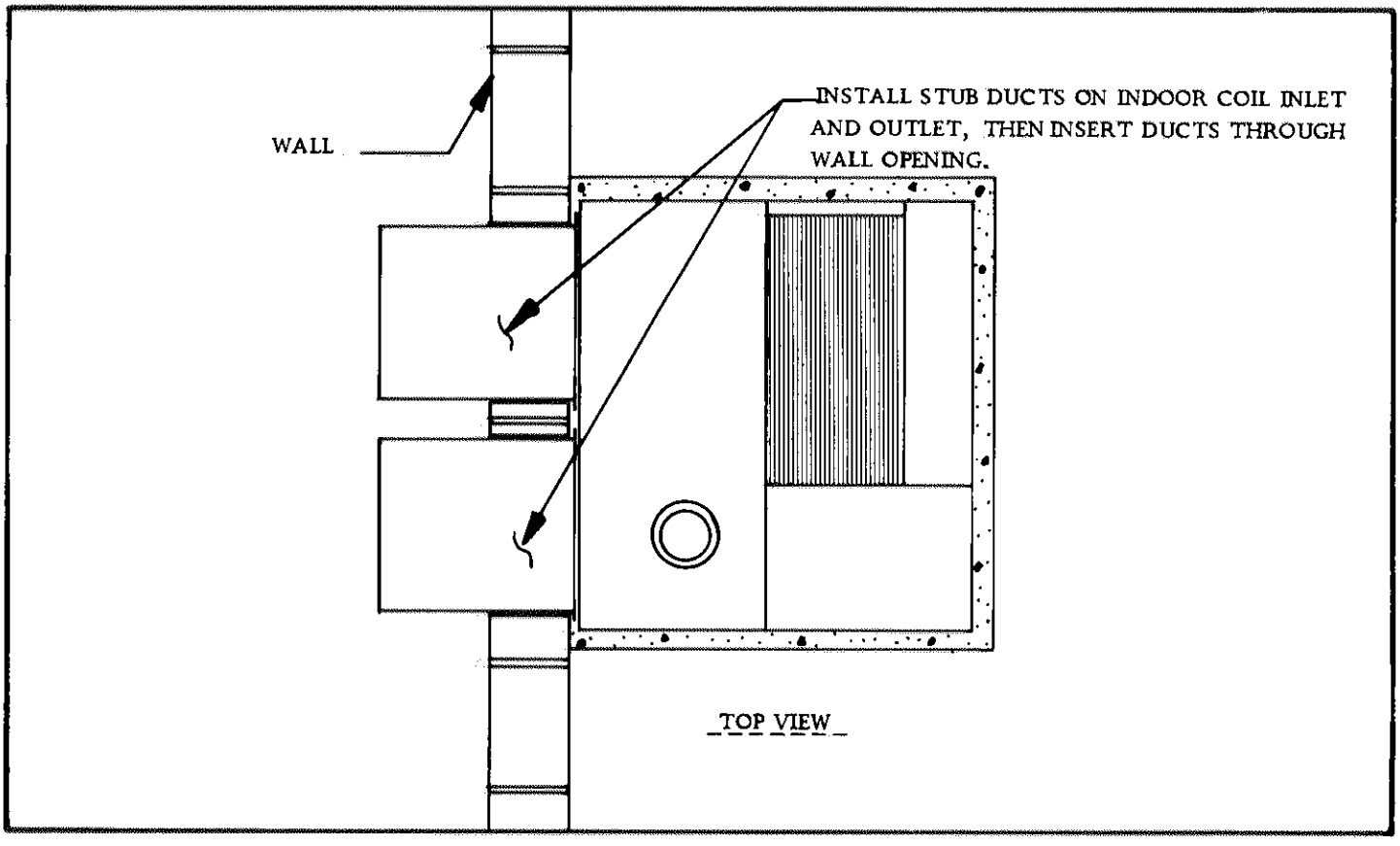


FIGURE 2

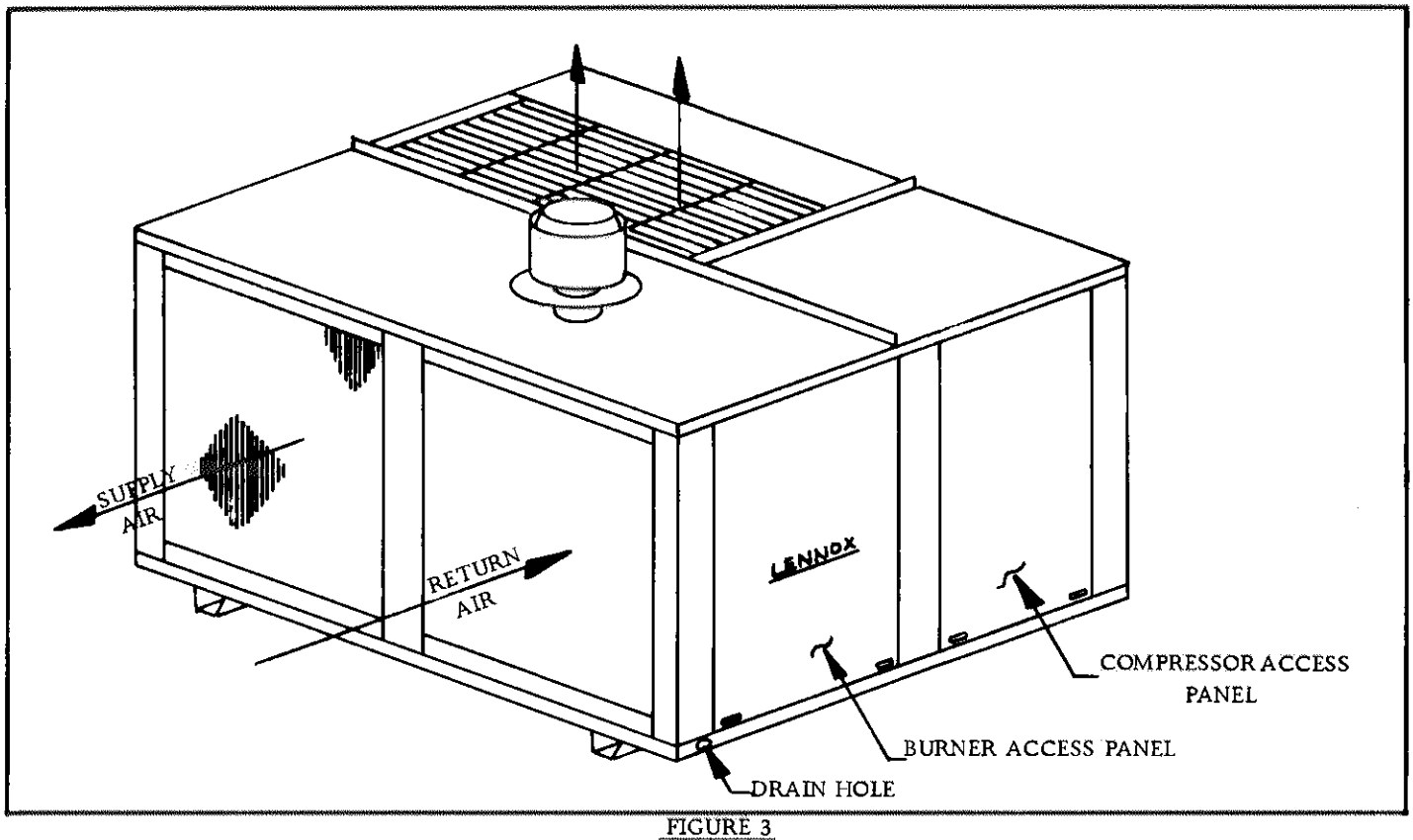


FIGURE 3

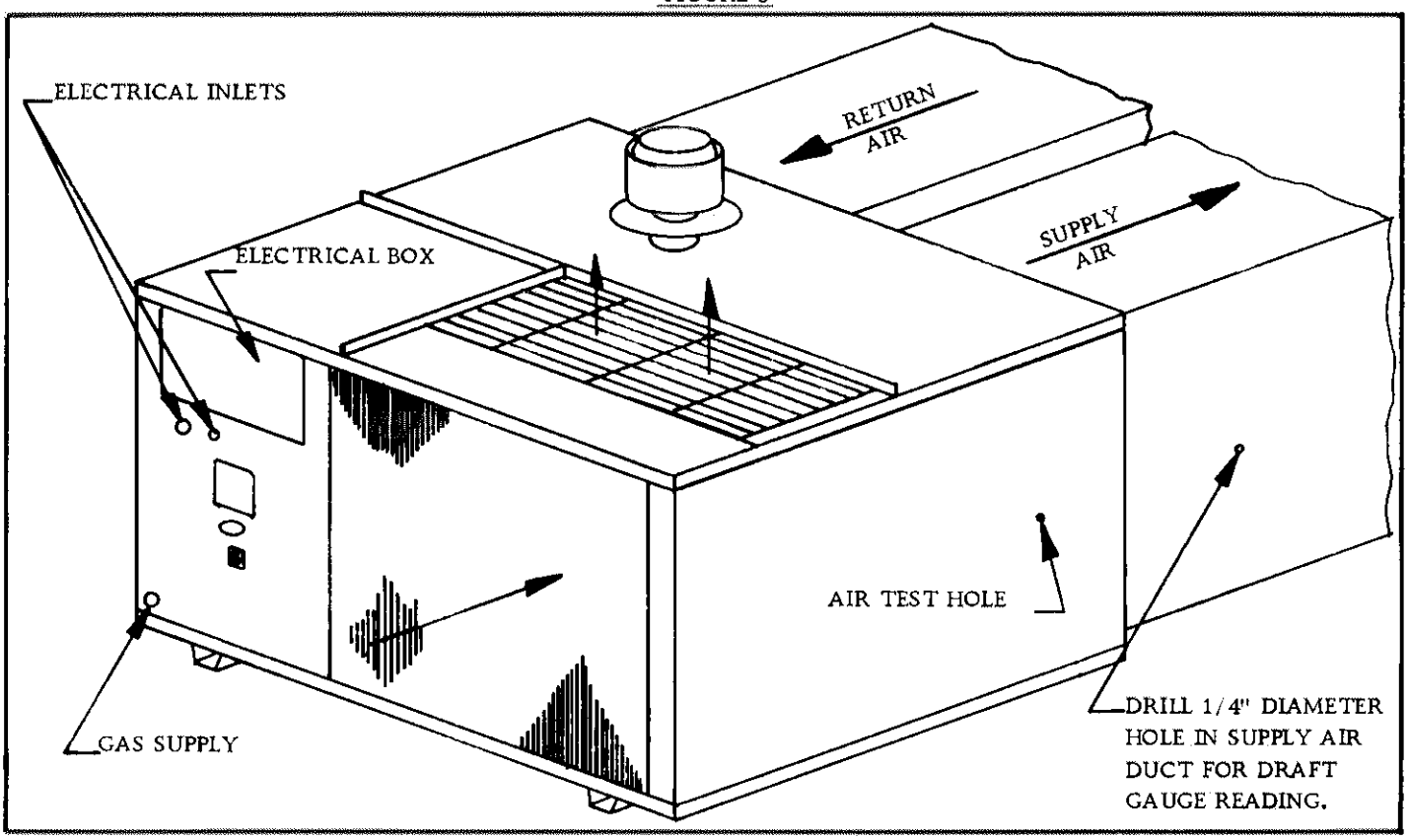


FIGURE 4

4- Inspect all electrical wiring, both field and factory installed, for loose connections. Be sure disconnect switch is in the "Off" position.

5- Check voltage supply at the disconnect switch. The voltage must be within plus or minus 10% of the range listed on the unit nameplate. If voltage supply is not within this range, do not proceed with the installation until the power company is consulted and the voltage condition is corrected.

6- Be sure all valves are open.

7- Set the system switch on the thermostat in the "Cool" position and the fan switch in the "Cont." position. Move cooling selector to desired temperature, then turn on power.

8- Recheck voltage with the unit running. If power is not within plus or minus 10% of the range listed on the unit nameplate, stop the unit and consult the power company. Check amperage draw of the unit. Refer to Table 2 for correct running amps.

C-Checking Charge

Allow unit to run for a few minutes to stabilize the system.

1- Using a thermometer, find the condenser entering air temperature. Read the suction and discharge pressures at the gauge manifold.

2- From the operating pressure curve, find the suction pressure recorded in the left hand column. Follow across to the correct entering air temperature. Mark this point. Now read directly below to the discharge pressure. If the discharge pressure is within 3 psig, the unit is properly charged. If adequately charged, remove gauge manifold and proceed with blower adjustment and checking heat heat cycle.

3- If the discharge pressure is 3 psig or more below the chart value, the unit is under charged. Refer to the section entitled - CHARGING in these instructions.

D-Charging

If the system is completely void of refrigerant, the recommended and most accurate method of charging the system is to weigh the refrigerant into the unit according to the amount shown on the unit nameplate. If weighing facilities are not available, use the following procedure:

1- Connect center port of gauge manifold to refrigerant drum, set the drum in upright position, then open drum valve. Purge center gauge port line by loosening connection at gauge manifold, then tightening gauge line.

2- Open manifold low pressure gauge and start compressor allowing the refrigerant to enter the system. Meter the refrigerant to enter the system. Meter the refrigerant into the system in small amounts.

3- Allow system to run for a few minutes to stabilize, then check the operating pressures against the operating pressure curve for the prevailing condenser entering air temperature.

4- Repeat this procedure until unit is properly charged, then disconnect gauge manifold. Replace gauge port caps.

E-Adjustment of Blower Speed

It is very important that the proper air volume be provided over the evaporator coil. Table 1 shows a range of air volumes and equivalent draft gauge readings for this unit. The draft gauge readings for each air volume is given in a range reading.

One air test hole is provided in the rear panel of the unit for draft gauge readings. The other draft gauge hole must be drilled in the supply air duct as shown in Figure 4. Insert the draft gauge lines in the air test holes.

To start blower motor, move thermostat heat selector lever to the lowest setting. Move the cooling selector lever to highest setting. Place system switch in the "Cool" or "Auto." position and the fan switch in the "Cont." position. Indoor blower only will operate.

With blower motor running, observe draft gauge reading. If reading is below range selected in Table 1, increase blower speed. If reading is above range selected, reduce blower speed. Adjust the blower motor speed so that the static pressure reading falls within the range shown in Table 1 for the air volume required. Refer to the Wiring Diagram on the control box cover for direct drive blower speed.

After required draft gauge reading is obtained, remove draft gauge and replace snap holes plugs. Turn off blower motor.

TABLE 1

DRAFT GAUGE READINGS (DRY EVAPORATOR)		
UNIT	CFM	STATIC PRESSURE (In. Water)
GCS1-261-60	700	.09 - .11
	800	.12 - .14
GCS1-261-90	900	.15 - .17
	1000	.18 - .20
GCS1-411-90-1	1100	.13 - .14
	1200	.16 - .17
GCS1-413-90-1	1300	.18 - .19
	1400	.21 - .23
GCS1-411-120-1	1100	.16 - .18
	1200	.19 - .21
GCS1-413-120-1	1300	.22 - .24
	1400	.25 - .27
GCS1-651-150	1800	.30 - .32
	2000	.36 - .38
GCS1-653-150	2200	.41 - .43
	2400	.53 - .55

NOTE: These readings are not total resistance readings, but pressure drop readings across the coil.

XII-START-UP AND ADJUSTMENTS (HEATING CYCLE):

A-Start-Up Procedure

This unit is equipped with an automatic reigniter pilot system. It is never necessary to manually light the pilot. In case of safety shutdown, break main disconnect switch and wait 5 minutes before turning power back on.

Pilot will stay on permanently during the heating season. In case of pilot outage, the pilot system will automatically

reignite the pilot. When the thermostat is set for cooling, the pilot is out and the automatic pilot system is de-energized. Use the following procedure to start the burner:

1- Close main gas valve and pilot valve. Set room thermostat to lowest setting. Wait 5 minutes.
2- Open main gas valve.
3- Open pilot valve.
4- Set room thermostat to heating and the desired temperature. Wait for pilot to prove; burner should now operate if the thermostat is calling for heat.

A "peekhole" is provided in the combustion air front panel to observe the pilot and burner operation.

NOTE: On initial startup of heating section unit, check alignment burners and make sure each burner ignites. Crossover ribbons on burner must be aligned to insure proper igniting of all burners.

B-Burner Adjustment

Air shutters are factory set for maximum efficiency. Do not change settings unless burner operation is unsatisfactory. Minor adjustments for flame lifting, burner noise, etc., may be necessary.

C-Blower Adjustment for Proper Air Temperature Rise

Adjust the blower speed for the proper air temperature rise (listed on the A. G. A. nameplate). To measure this temperature rise, place plenum thermometers in the warm air and return air plenums. Locate the thermometers in the warm air plenum where the thermometer will not "see" the heat exchanger, thus picking up radiant heat. Turn up thermostat as high as possible to start the unit. After plenum thermometer has reached its highest and steadiest reading, subtract the reading of the return air thermometer from the warm air thermometer. The difference should be in the range listed on the A. G. A. nameplate. If this temperature is low, open adjustable blower pulley on belt drive units or wire the direct drive blower to a slower speed controller wire. If the temperature is high, close adjustable pulley for belt drive unit or select a higher speed on speed controller for direct drive blowers. Repeat either of these procedures until desired setting in this range is obtained.

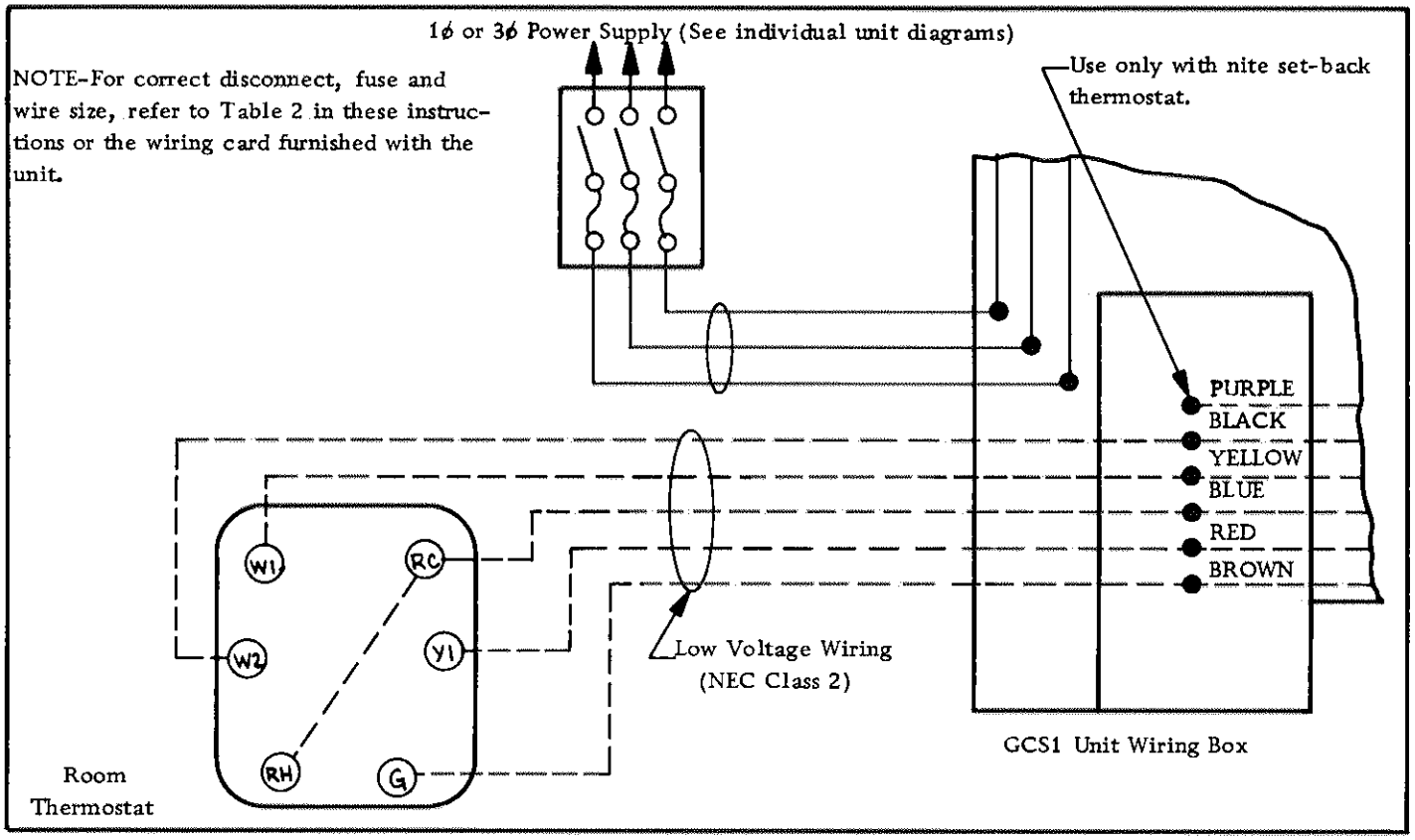
XII-CLEAN-UP:

After unit is operating properly, proceed with the following:

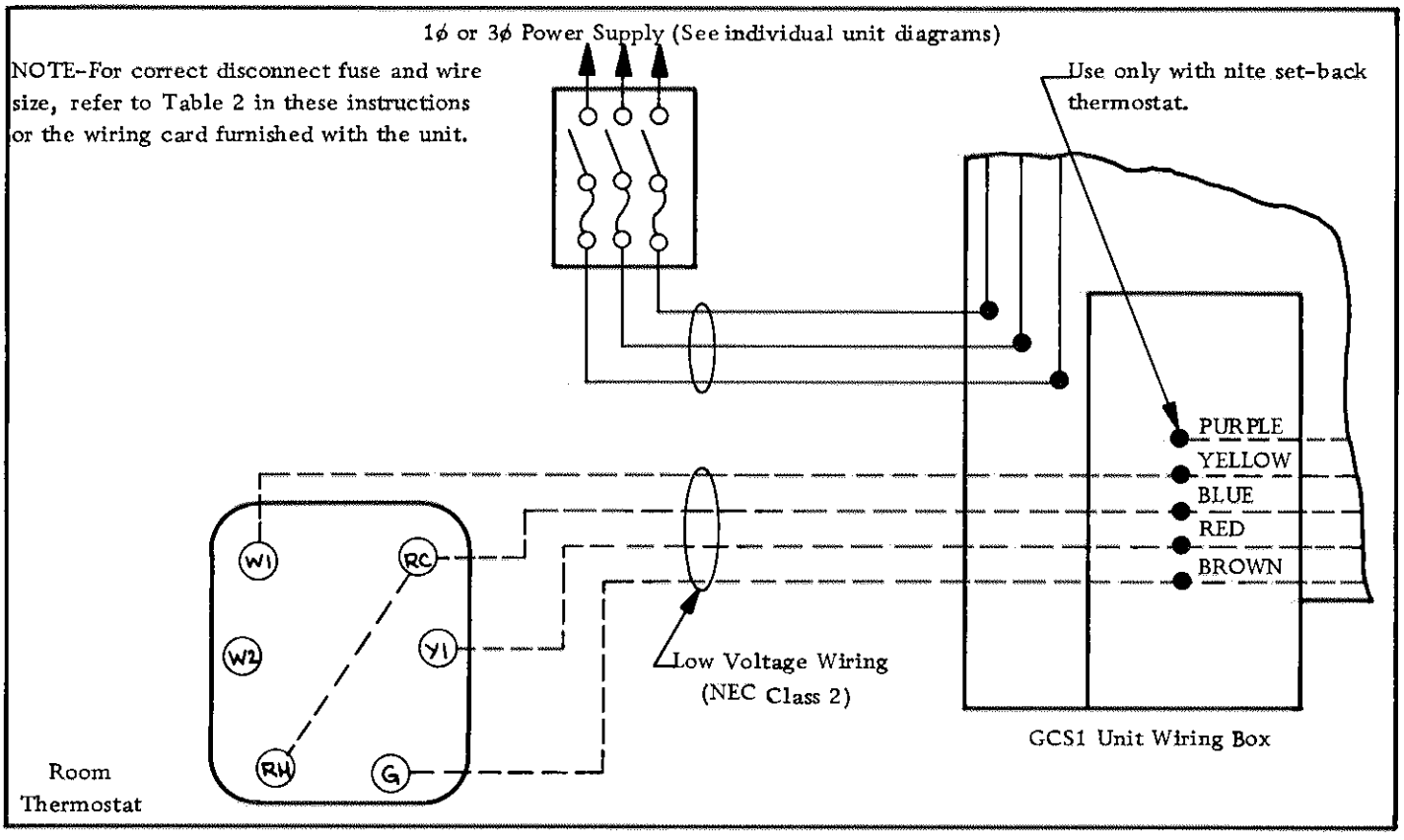
A-Replace control panel covers and access panels.
B-Set room thermostat at desired setting.
C-Leave the operating instruction card and warranty form with the owner or in an obvious place in the equipment room.
D-Pick up all shipping cartons, metal scraps, extra insulation, etc., and generally clean up the installation.

XIII-MAINTENANCE:

Complete instructions for lubricating motors and bearings, starting and operation of unit and cleaning filters are provided in the "Operating and Maintenance Instructions" packed with the unit.



FIELD WIRING FOR GCS1 SERIES - TWO STAGE HEATING



FIELD WIRING FOR GCS1 SERIES - SINGLE STAGE HEATING

TABLE 2

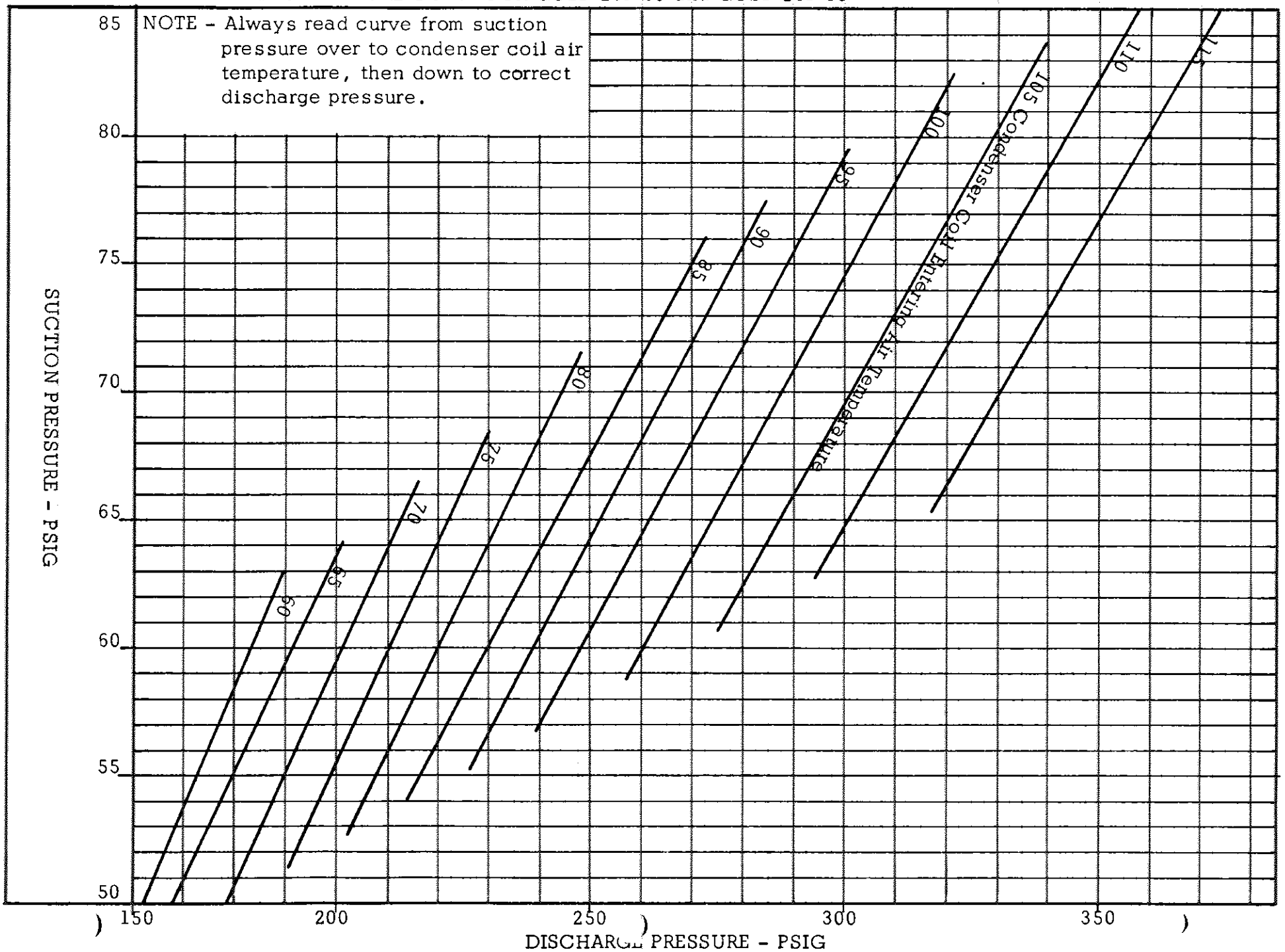
A.G.A. RATING MODEL NUMBER	GCS1-261-60 GCS1-261-90	GCS1-261-60 GCS1-261-90	GCS1-261-60 GCS1-261-90	GCS1-261-60 GCS1-261-90	GCS1-411-90-1 GCS1-411-120-1	GCS1-413-90-1 GCS1-413-120-1
UNIT IDENTIFICATION NUMBER	GCS1-261-60-3 GCS1-261-90-3	GCS1-120-60-3-208 GCS1-261-90-3-208	GCS1-261-60-4 GCS1-261-90-4	GCS1-261-60-4-208 GCS1-261-90-4-208	GCS1-411-90-3 GCS1-411-120-3	GCS1-413-90-3 GCS1-413-120-3
Refrigerant (type)	R-22	R-22	R-22	R-22	R-22	R-22
Refrigerant charge shipped (lbs.)	5 lbs. 2 oz.	5 lbs. 2 oz.	5 lbs. 5 oz.	5 lbs. 5 oz.	8 lbz. 0 oz.	8 lbs. 0 oz.
Hi-pressure control cutout setting (lbs/sq. in.)	None	None	None	None	410	410
Low-pressure control out- setting (lbs/sq. in.) in-	None	None	7 30	7 30	7 30	7 30
COMPRESSOR:						
Type	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic
Model Number	AH24P12	AH24P12	CH490TA-2	CH490TA-5	CL31Y14	CL31Y14
Nominal watts	2600	2600	2550	2550	4220	4220
Oil	Suniso 3G Tex. Cap B	Suniso 3G Tex. Cap B	Suniso 4G	Suniso 4G	Suniso 4G	Suniso 4G
Oil charge (oz.)	45	45	48	48	112	112
CONDENSER FAN:						
Nominal watts	280	280	280	280	545	545
Fan motor hp	1/6	1/6	1/6	1/6	1/3	1/3
Fan pulley dia. (in.)	Direct Drive	Direct Drive	Direct Drive	Direct Drive	Direct Drive	Direct Drive
Motor pulley dia. (in.)	Direct Drive	Direct Drive	Direct Drive	Direct Drive	Direct Drive	Direct Drive
Belt length (in.)	Direct Drive	Direct Drive	Direct Drive	Direct Drive	Direct Drive	Direct Drive
Cfm air over condenser	2050	2050	2050	2050	2250	2250
EVAPORATOR FAN:						
Nominal watts	340	340	340	340	550	550
Motor hp	1/6	1/6	1/6	1/6	1/3	1/3
Motor pulley dia. (in.)	Direct Drive	Direct Drive	Direct Drive	Direct Drive	Direct Drive	Direct Drive
Fan pulley dia. (in.)	Direct Drive	Direct Drive	Direct Drive	Direct Drive	Direct Drive	Direct Drive
Belt length (in.)	Direct Drive	Direct Drive	Direct Drive	Direct Drive	Direct Drive	Direct Drive
Cfm air over evaporator	800-1000	800-1000	800-1000	800-1000	1200-1500	1200-1500
ELECTRICAL DATA:						
Electrical Characteristics	230v 60 cy, 1ø	208v 60 cy, 1ø	230v 60 cy, 1ø	208v 60 cy, 1ø	230v 60 cy, 1ø	208/230v 60 cy, 3ø
Compressor full load amps	13.0	13.0	13.0	13.0	23.0/21.0	12.6
Compressor power factor	.92	.92	.92	.92	.92	.85
Compressor locked rotor amps	51.0	53.0	48.0	54.0	92.5	66.0
Condenser full load amps	1.4	1.4	1.4	1.4	3.2	3.2
Condenser locked rotor amps	2.9	2.9	2.9	2.9		
Evaporator full load amps	1.4	1.4	1.4	1.4	3.0	3.0
Evaporator locked rotor amps	2.9	2.9	2.9	2.9		
Wire size - AWG 1' to 100'	12	12	12	12	8	10
Wire size - AWG 101' to 200'	10	10	10	10	6	8
Disconnect size	30	30	30	30	60	30
Fusetron size	20	20	20	20	40	30
Maximum allowable fuse size	30	30	30	30	50	30

TABLE 2

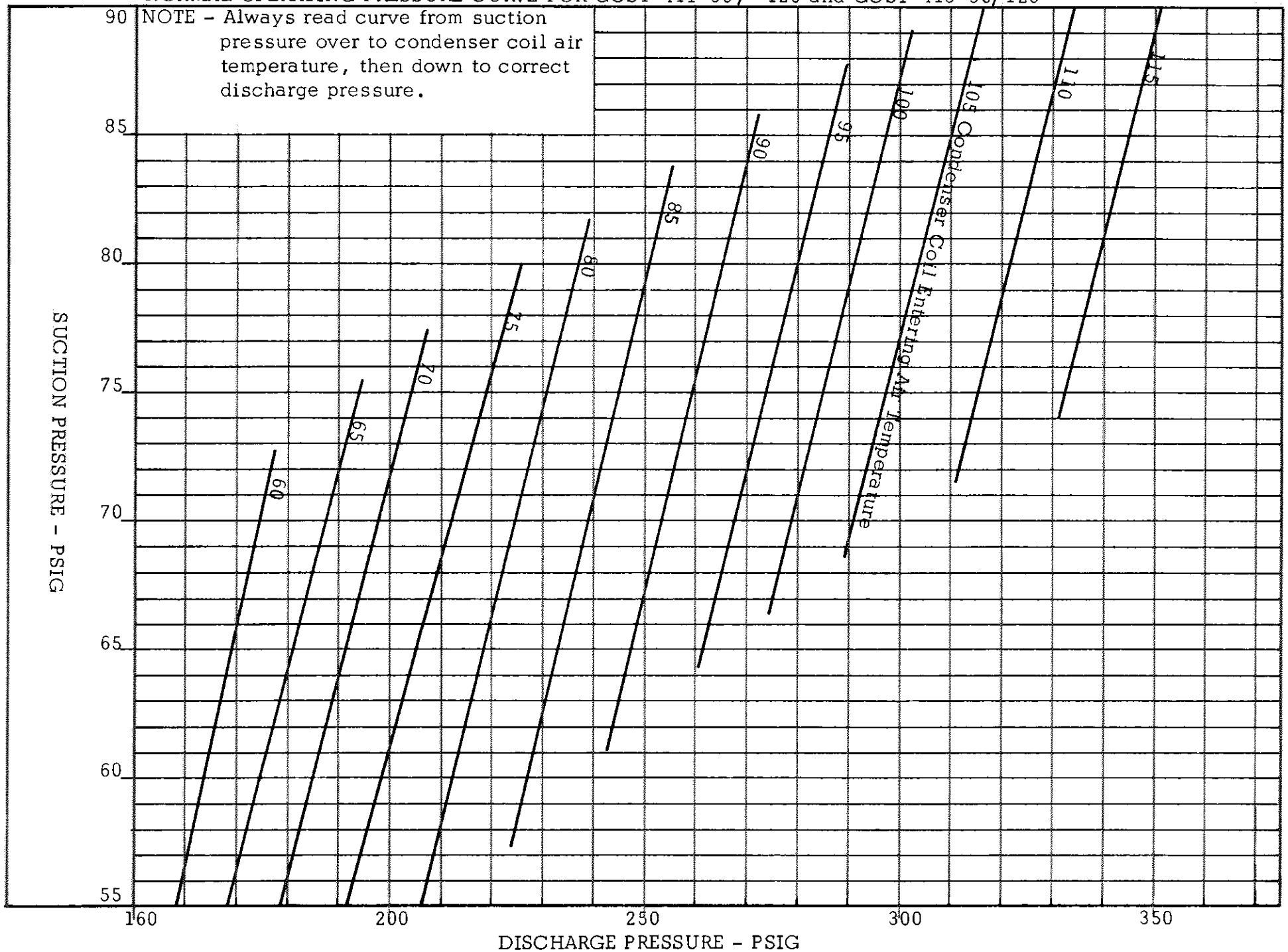
A. G. A. RATING MODEL NUMBER	GCS1-413-90-1-440 GCS1-413-120-1-440	GCS1-651-150	GCS1-653-150	GCS1-653-150-440	GCS1-651-150-550
UNIT IDENTIFICATION NUMBER	GCS1-413-90-3-440 GCS1-413-120-3-440	GCS1-651-150-3	GCS1-653-150-3	GCS1-653-150-3-440	GCS1-651-150-3-550
Refrigerant (type)	R-22	R-22	R-22	R-22	R-22
Refrigerant charge shipped (lbs.)	8 lbs. 0 oz.	9 lbs. 13oz.	9lbs. 13oz.	9lbs. 13oz.	9lbs. 13oz.
Hi-pressure control cutout setting (lbs/sq. in.)	410	410	410	410	410
Low-pressure control out- setting (lbs/sq. in.) in-	7 30	5 30	5 30	5 30	5 30
COMPRESSOR:					
Type	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic
Model Number	CL31Y14	CL51ZH17	CL51ZH17	CL51ZH17	CL51ZH17
Nominal watts	4220	7150	7150	7150	7150
Oil	Suniso 4G	Suniso 3G Tex. Cap B	Suniso 3G Tex. Cap B	Suniso 3G Tex. Cap B	Suniso 3G Tex. Cap B
Oil charge (oz.)	112	45	45	45	45
CONDENSER FAN:					
Nominal watts	545	530	530	530	530
Fan motor hp	1/3	1/3	1/3	1/3	1/3
Fan pulley dia. (in.)	Direct Drive	Direct Drive	Direct Drive	Direct Drive	Direct Drive
Motor pulley dia. (in.)	Direct Drive	Direct Drive	Direct Drive	Direct Drive	Direct Drive
Belt length (in.)	Direct Drive	Direct Drive	Direct Drive	Direct Drive	Direct Driv.
Cfm air over condenser	2250	4300	4300	4300	4300
EVAPORATOR FAN:					
Nominal watts	550	860	860	860	860
Motor hp	1/3	3/4	3/4	3/4	3/4
Motor pulley dia. (in.)	Direct Drive	5/8 x 4-1/8	5/8 x 4-1/8	5/8 x 4-1/8	5/8 x 4-1/8
Fan pulley dia. (in.)	Direct Drive	1 x 7	1 x 7	1 x 7	1 x 7
Belt length (in.)	Direct Drive	44 'A' Sec.	44 'A' Sec.	44 'A' Sec.	44 'A' Sec.
Cfm air over evaporator	1200-1500	2210	2210	2210	2210
ELECTRICAL DATA:					
Electrical Characterisitics	440v 60 cy, 3ø	230v 60 cy, 1ø	208/240v 60 cy, 3ø	440v 60 cy, 3ø	550v 60 cy, 3ø
Compressor full load amps	6.5	33.0	21.0	10.5	8.4
Compressor power factor	.85	.92	.85	.85	.85
Compressor locked rotor amps	30.0	135.0	110.0	56.0	41.0
Condenser full load amps	3.2	2.3	2.3	2.3*	2.3*
Condenser locked rotor amps		5.7	5.7	5.7*	5.7*
Evaporator full load amps	3.0	5.2	5.2	2.6	1.9
Evaporator locked rotor amps		27.0	27.0	18.0	15.0
Wire size - AWG 1' to 100'	14	6	8	12	12
Wire size - AWG 101' to 200'	12	4	6	10	10
Disconnect size	30	60	60	30	30
Fusetron size	15	55	40	20	20
Maximum allowable fuse size	20	80	50	25	20

* Supplied from stepdown transformer 230v, 1ø

NORMAL OPERATING PRESSURE CURVE FOR GCS1-261-60 and GCS1-261-90



NORMAL OPERATING PRESSURE CURVE FOR GCS1-411-90, -120 and GCS1-413-90, -120



Normal Operating Pressure Curves For GCS1-651-150 and GCS1-653-150