

WARNING

ALWAYS MEASURE START WINDING CURRENT ON START-UP!

NORMALLY 2 to 8 AMPS (See Page 4 for Details)

H23A TWO SPEED SERIES

INSTALLATION & SERVICE INSTRUCTIONS

**AIR CONDITIONING/HEAT PUMP
COMPRESSORS**

BRISTOL 
COMPRESSORS, INC.

PLEASE NOTE: Bristol compressors are completely interchangeable with other manufacturers. However, electrical specifications and hook-ups vary. Before installing and starting this compressor, review the wiring diagrams and check for correct electrical components.

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WARNING: The air conditioning unit is a pressurized system and hazards exist which could result in personal injury. It is therefore recommended that removal and installation of the hermetic compressor be performed by experienced personnel only.

WARNING: Never use oxygen to pressurize a refrigeration or air conditioning system. Oxygen can explode on contact with oil and could cause personal injury. When using high pressure gas such as nitrogen or CO₂ for this purpose, be sure to use a regulator that can control the pressure down to 1 or 2 psig.

The following instructions are general but include major points of consideration that will ensure proper installation and protect you from possible personal injury. Please use this as a checklist, taking each item in its order before proceeding to the next. If more information is required, please call Bristol Compressors Service Department.

- 1. **VERIFY PROPER APPLICATION.** Verify that the compressor being replaced and the Bristol compressor have a like capacity for the refrigerant being used and that the voltage and frequency characteristics are the same. Consult your wholesaler if you have any questions about proper compressor application.

WARNING: To avoid electrical shock, power to the compressor should remain off during performance of Steps 2 thru 9.

- 2. **DETERMINE CAUSE OF INITIAL FAILURE.** In order to prevent a second failure, the cause of the original failure must be determined. Identify the cause and make the necessary repairs.
 - A. **BEFORE REMOVING THE FAULTY COMPRESSOR:** Remove refrigerant charge using proper recovery procedures. Call 1-800-441-9450 for the name of the nearest Dupont authorized distributor, or 1-800-631-8138 for Genetron Representative or 1-800-ASK-KLEA (ICI) for information on refrigerant reclaim program.
 - B. Remove the electrical leads from the compressor. Note the terminal to which each wire is connected.
 - C. During the next operation, the access ports should be open so that pressure does not build up in the system. Use a high temperature torch to sweat the suction line and the discharge line loose from the compressor.
 - D. **To assure excessive oil does not remain in the system, measure oil in failed compressor.**

NOTE: If oil level is low, flush excess from system.

CAUTION: Be sure to handle with extreme care using proper protection equipment. After confirming oil charge level, return oil to the compressor and **braze all tubes closed.**

- 3. **MOUNT THE NEW COMPRESSOR.** Do not remove dust cover or rubber shipping plugs until all other connections have been completed (i.e., filters installed and all tubing changes made — see steps 4, 5 and 6). Compressor should not be open to the atmosphere for more than 15 minutes. Be sure to use the new mounting grommets that were shipped with the compressor. If the mounting sleeves shipped with the compressor are used, the mounting bolts will bottom out when tight. Use care not to over-compress the mounting grommets when the mounting sleeves cannot be used.

- 4. **INSTALL FILTER DRIERS.** Bristol Compressors recommends the use of adequately sized liquid and suction line driers anytime a compressor is replaced. If the new compressor is used to replace a compressor with a burned motor, the use of high acid neutralizing filter drier is recommended. **For heat pumps, a suction filter drier must be installed between the accumulator and the compressor suction inlet. In addition, a two-way heat pump liquid line drier or factory recommended driers must be installed.** **NOTE: ALWAYS REMOVE OLD FILTER DRIERS.**

- 5. **BRAZE ON SUCTION AND DISCHARGE LINES.** Flow an inert gas, such as nitrogen or CO₂, through the system at approximately 2 psig. This will reduce the possibility of oxidation inside the tubing. Braze on the

suction and discharge lines and braze the process tube shut following the recommendation listed below (if the process tube is to be used, it should be brazed shut after the system has been charged):

COPPER TUBING: If additional copper tubing is required, use only clean, dehydrated refrigeration grade tubing with sealed ends.

BRAZING ALLOYS: **CAUTION: Do not use 95/5, 50/50 or 40/60 soft solder for brazing.** Use Sil-Fos or Phos Copper, or similar brazing alloys with high tensile strength on copper welds only. Weld steel to copper only with silver brazing alloys.

BRAZING PROCEDURE: To ensure properly brazed joints, Bristol Compressors recommends that the following steps be used:

- a. Exercise extreme care when cutting and forming tubes to keep dirt, filings, and other contaminants from entering the system.
- b. Do not use excessive amounts of brazing alloy as some of the excess may penetrate the joint and enter the system.
- c. If flux must be used, take necessary precautions to ensure that the flux does not enter the system.
- d. Use damp cloths or other heat absorbent material to ensure that the factory brazed joints on the compressor do not become damaged. If damp cloths are used, take care not to allow moisture to enter the system.
- e. Do not overheat brazed joints as excess heat will cause formation of copper oxide on the inside wall of the tubing. Flow an inert gas through the system, as explained above.

6. **CHECK SYSTEM FOR LEAKS.** After installation is complete, pressurize the system to 75 psig using nitrogen and a few ounces of system refrigerant. Check for leaks using a halide torch, soap bubbles or an electronic halogen leak detector. When all connections test satisfactorily, release pressure using proper recovery procedures, then proceed to next step.

CAUTION: Do not use the Bristol replacement compressor as an evacuation assist and never apply voltage to a compressor while it is in a vacuum as damage could result to the compressor.

7. **EVACUATE THE SYSTEM.** Use a vacuum pump designed for this purpose. Vacuum must be pulled on the discharge (high side) and suction (low side) of the system. Evacuate to 200 microns or lower.

8. **CHECK THE ELECTRICAL SYSTEM.** While the system is evacuating, check all electrical components. If faulty, or signs of degradation are found, remove and replace. Check all connections and terminals to be sure they are tight. Verify the electrical system is wired according to the unit's manufacturer and Bristol Compressors wiring diagram on page 6 (for single phase) and page 7 (for three phase). Verify the electrical components (single phase are listed on page 6). These components must be as specified. It is a normal practice to replace all starting components anytime a compressor is changed.

VERY IMPORTANT: Before applying power to the compressor, be sure to perform a functional check of the motor protection systems. This can be done by wiring the provided module as shown with the appropriate schematic on pages 6 and 7, leaving the power supply wires from the main contactor open — **NO POWER TO THE COMPRESSOR**. Then apply control circuit power; main contactor should pull in (or energize), assuming all other safeties are closed. Next, carefully remove module sensor wires from compressor (only one is necessary) — **TAKE CARE NOT TO SHORT LEAD AGAINST HOUSING** — approximately 24 vac on leads. The main contactor should immediately open. If this does not happen, thoroughly check control wiring until this functional check is positive. Then complete the system wiring.

WARNING: Voltage should not be applied to the compressor with the terminal cover and screws removed as personal injury could result.

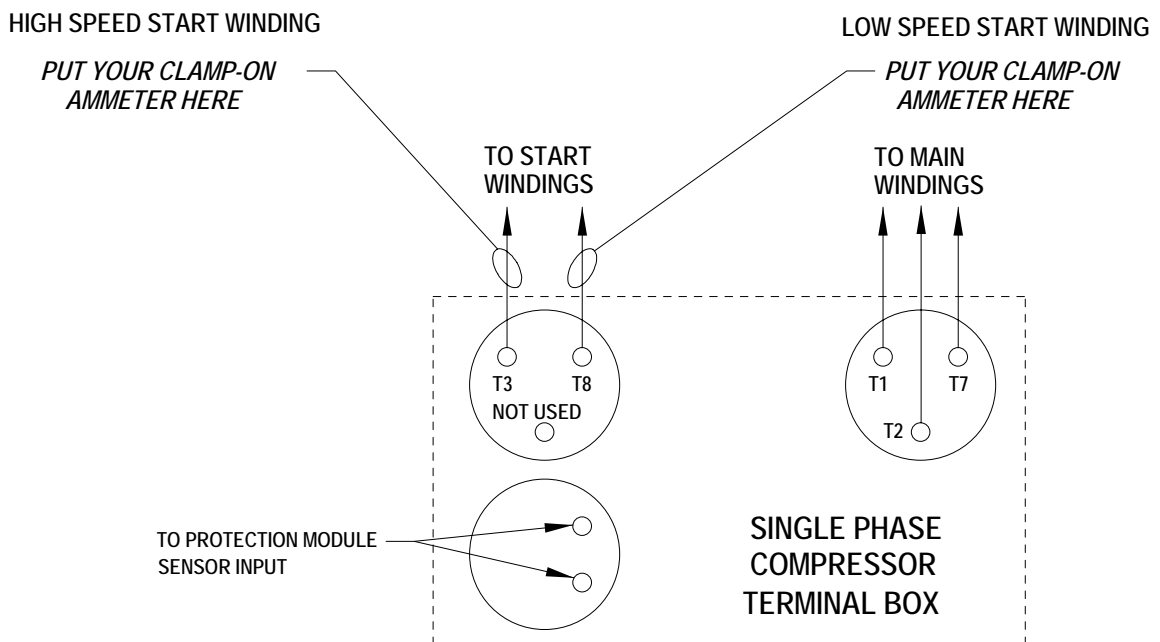
9. **CHARGE THE SYSTEM.** When a vacuum of at least 200 microns is reached, close gauge valve, remove vacuum pump and break the vacuum using system refrigerant vapor. Never dump liquid refrigerant into the compressor. Liquid can be used to break the vacuum if it is connected to the liquid line, not the discharge line.

Charge the system according to the manufacturer's specifications. Be sure to compensate the charge for the addition of the filter drier. The preferred superheat should be 18-20°F at the compressor on a system with a TXV, see Step 11.

WEIGHING in the system charge to the factory specification will help point out system faults that may still exist.

10. **START UP. CLAMP-ON AMMETER MUST BE IN PLACE BEFORE POWER IS APPLIED TO MONITOR START WINDING CURRENT ON START-UP!!** See below

ASSURE NORMAL START WINDING CURRENT ON START-UP (20 AMPS AND DROP TO 2 - 8 AFTER START). IF CURRENT IS EXCEEDED FOR MORE THAN 5 SECONDS, DISCONNECT POWER. CORRECT FAULT BEFORE RESTARTING.



11. **WORST CASE CONDITION CHECKS (LOW AND HIGH SPEED OPERATION).**

HEAT PUMP

STEP 1: Operate system in the heating mode with outdoor fan disconnected.

STEP 2: Run system until the designed winter condition in your area is reached (may need to cover coil for this test).

STEP 3: Check compressor superheat 6" from compressor inlet.

STEP 4: Superheat should not drop below 5° (prefer no lower than 10°).

STEP 5: Sump temperature should always be 50° or higher above saturated suction temperature.

EXAMPLE: "R-22"

$$\begin{aligned} 38 \text{ psig} &= 16^\circ = \text{SATURATED SUCTION} \\ &+ 50^\circ = \text{MINIMUM TEMP. DIFFERENCE} \\ &66^\circ = \text{MINIMUM SUMP TEMPERATURE} \end{aligned}$$

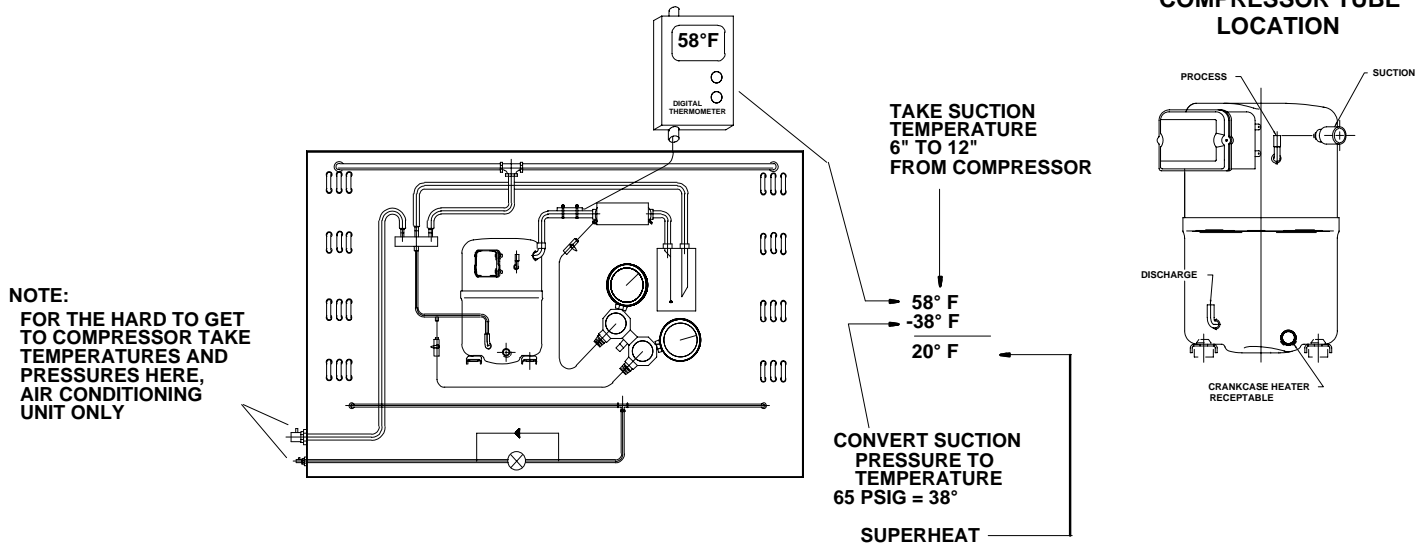
COOLING MODE (HEAT PUMP)

STEP 1: Operate system in cooling mode with indoor fan disconnected and repeat steps 3, 4 and 5.

STRAIGHT AIR-CONDITIONING UNITS

STEP 1: Operate system in the cooling mode with indoor fan disconnected and repeat steps 3, 4 and 5.

HOW TO CHECK SUPERHEAT



12. **CHECK FILTER DRIER FOR CONTAMINATION.** If internal contamination is heavy, the suction line filter drier may become clogged and ineffective. Check the pressure drop across the filter drier after approximately 8 hours running time and, if it exceeds 2 psig, replace.

REVIEW ALL TWELVE STEPS TO MAKE SURE NOTHING WAS OVERLOOKED.

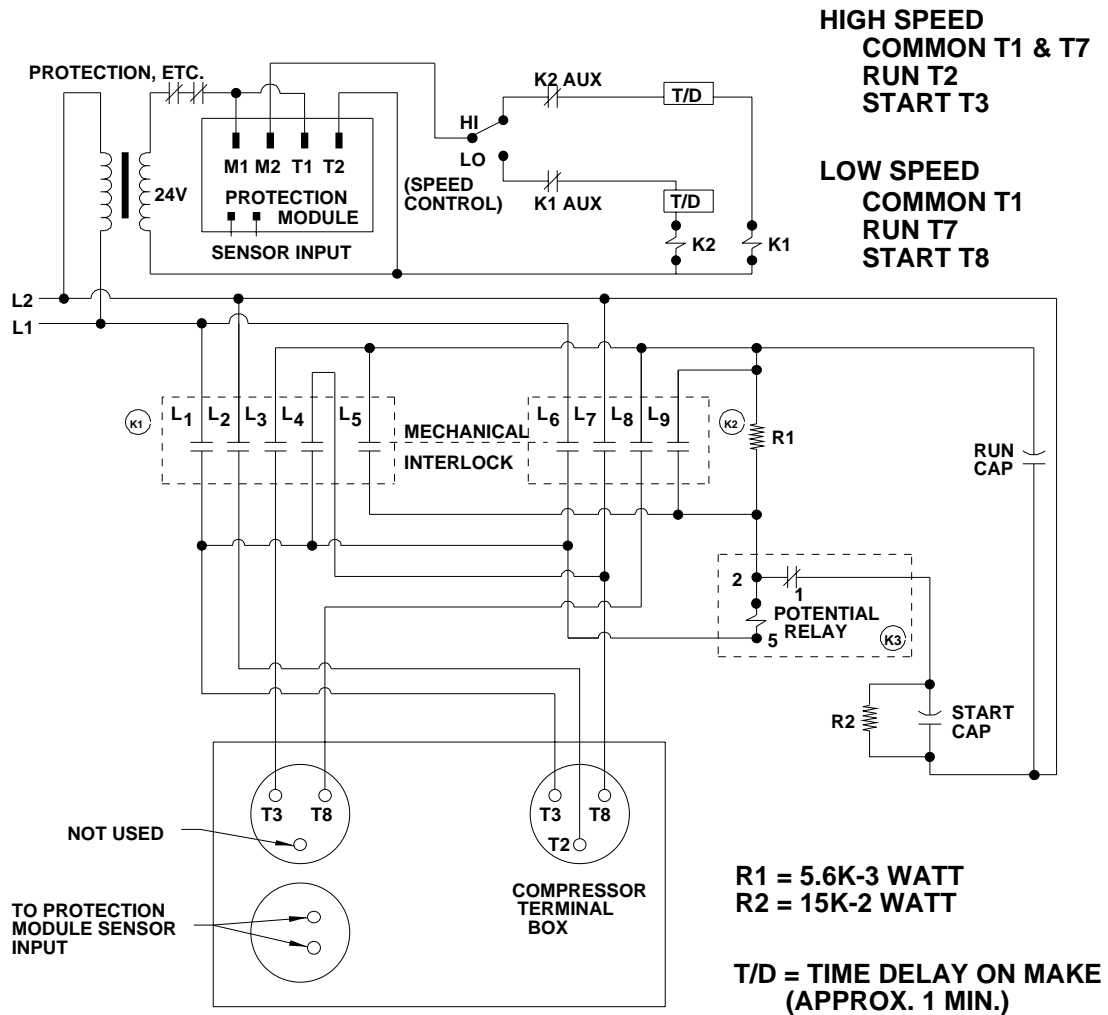
H23A TWO SPEED START COMPONENTS

Model	Run Capacitor	Start Capacitor	Start Relay
H23A353JPCA	35/440	145-175/330	GE3ARR3*6B*
H23A463JPCA	35/440	145-175/330	GE3ARR3*4A*
H23A563JPCA	50/440	175-216/330	GE3ARR22*4B*
H23A623JPCA	55/440	175-216/330	GE3ARR22*4B*

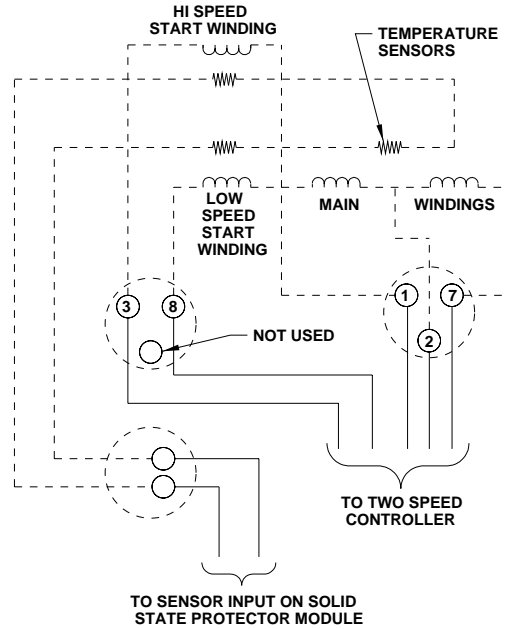
Texas Instruments 15AA and Robertshaw MP50 Models have a 4 minute time delay anytime the power supply to terminals T₁ and T₂ is interrupted or after the motor sensors have seen a faulty condition. Voltage to T₁ and T₂ must be as marked on the module.

Control voltage through M₁ - M₂ on the module can be different from the supply voltage to T₁ and T₂. M₁ and M₂ must be used in series with one of the control voltage wires going to the contactor coil. Refer to single phase control wiring for time delays.

H23A 2-SPEED - SINGLE PHASE CONTROL WIRING

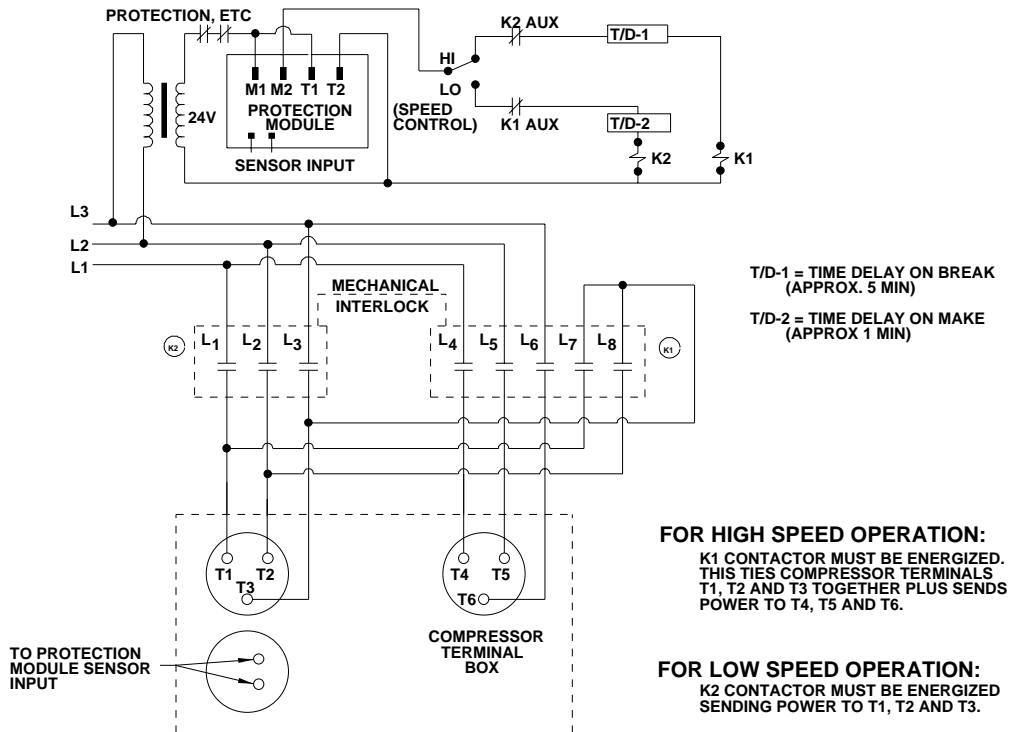


SINGLE PHASE WINDING RESISTANCE VALUES				
MODEL	HIGH SPEED		LOW SPEED	
	MAIN (T1 + T7) TO T2	START T1 TO T3	MAIN T1 TO T7	START T1 TO T8
H23A353JPC	0.584	3.76	1.510	3.10
H23A463JPC	0.342	3.01	0.925	2.81
H23A563JPC	0.291	2.50	0.841	2.21
H23A623JPC	0.291	2.50	0.841	2.21

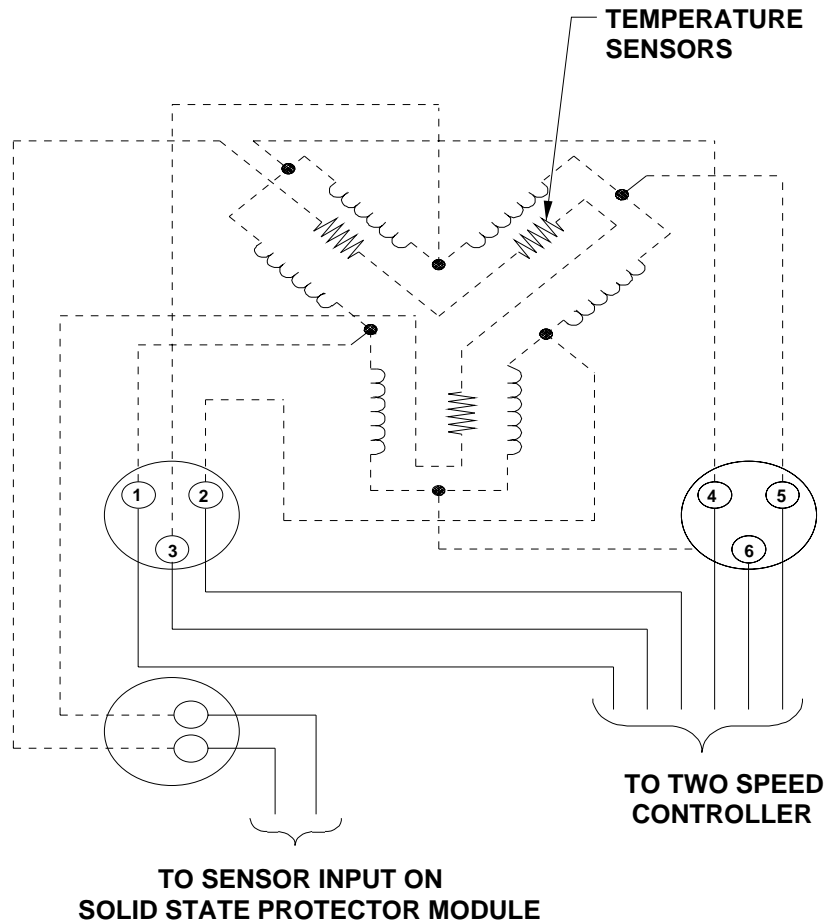


NOTE: All single phase two speed models must use a solid state protector module approved by Bristol Compressors. These modules are Robertshaw MP50, Texas Instruments 15AA and Lennox TSC.

H23A 2-SPEED - THREE PHASE CONTROL WIRING



FAILURE TO FOLLOW THIS WIRING DIAGRAM COULD RESULT IN COMPRESSOR FAILURE



THREE PHASE WINDING RESISTANCE VALUES						
MODEL	HIGH SPEED			LOW SPEED		
	T4 TO T6	T4 TO T5	T5 TO T6	T1 TO T3	T1 TO T2	T2 TO T3
H23A353GPD	1.51	1.51	1.51	2.02	2.02	2.02
H23A353GPE	6.03	6.03	6.03	8.04	8.04	8.04
H23A463GPD	1.12	1.12	1.12	1.49	1.49	1.49
H23A463GPE	4.79	4.79	4.79	6.37	6.37	6.37
H23A563GPD	0.831	0.831	0.831	0.831	0.831	0.831
H23A563GPE	3.45	3.45	3.45	4.60	4.60	4.60
H23A623GPD	0.831	0.831	0.831	1.11	1.11	1.11
H23A623GPE	3.45	3.45	3.45	4.60	4.60	4.60

NOTE: All three phase two speed models must use a solid state protector module approved by Bristol Compressors. These modules are Robertshaw MP50, Texas Instruments 15AA and Lennox TSC.

PRESSURE-TEMPERATURE RELATION CHART

PSIG	TEMPERATURE °F						
	R-22	R-502	R-12	134a	R404A	R-407C	
					Saturated Vap/Liq.	Saturated Vapor	Saturated Liquid
5*	-48	-57	-29	-22	-57	-41.0	-54.0
4*	-47	-55	-28	-21	-56	-39.5	-52.6
3*	-45	-54	-26	-19	-54	-38.1	-51.2
2*	-44	-52	-25	-18	-53	-36.8	-49.8
1*	-43	-51	-23	-16	-52	-35.5	-48.5
0	-41	-50	-22	-15	-50	-34.2	-47.2
1	-39	-47	-19	-12	-48	-31.8	-44.7
2	-44	-52	-25	-10	-46	-29.5	-42.3
3	-34	-42	-14	-8	-43	-27.2	-40.1
4	-32	-40	-11	-5	-41	-25.1	-37.9
5	-30	-38	-9	-3	-39	-23.1	-35.8
6	-28	-36	-7	-1	-37	-21.1	-33.8
7	-26	-34	-4	1	-35	-19.3	-31.9
8	-24	-32	-2	3	-33	-17.5	-30.1
9	-22	-30	0	5	-32	-15.7	-28.3
10	-20	-29	2	7	-30	-14.0	-26.6
11	-19	-27	4	8	-28	-12.4	-24.9
12	-17	-25	5	10	-27	-10.8	-23.3
13	-15	-24	7	12	-25	-9.2	-21.7
14	-14	-22	9	13	-23	-7.7	-20.1
15	-12	-20	11	15	-22	-6.3	-18.6
16	-11	-19	12	16	-20	-4.8	-17.2
17	-9	-18	14	18	-19	-3.5	-15.8
18	-8	-16	15	19	-18	-2.1	-14.4
19	-7	-15	17	21	-16	-0.8	-13.0
20	-5	-13	18	22	-15	0.5	-11.7
21	-4	-12	20	24	-14	1.8	-10.4
22	-3	-11	21	25	-12	3.0	-9.2
23	-1	-9	23	26	-11	4.2	-7.9
24	0	-8	24	27	-10	5.4	-6.7
25	1	-7	25	29	-9	6.6	-5.5
26	2	-6	27	30	-8	7.7	-4.3
27	4	-5	28	31	-6	8.9	-3.2
28	5	-3	29	32	-5	10.0	-2.1
29	6	-2	31	33	-4	11.0	-1.0
30	7	-1	32	35	-3	12.1	0.1
31	8	0	33	36	-2	-13.2	1.2
32	9	1	34	37	-1	14.2	2.2
33	10	2	35	38	0	15.2	3.3
34	11	3	37	39	1	16.2	4.3
35	12	4	38	40	2	17.2	5.3
36	13	5	39	41	3	18.1	6.3
37	14	6	40	42	4	19.1	7.2
38	15	7	41	43	5	20.0	8.2
39	16	8	42	44	6	20.9	9.1
40	17	9	43	45	7	21.8	10.1
42	19	11	45	47	8	23.6	11.9
44	21	13	47	49	10	25.4	13.6
46	23	15	49	51	12	27.1	15.4
48	24	16	51	52	14	28.7	17.0
50	26	18	53	54	16	30.3	18.7
52	28	20	55	56	17	31.9	20.3
54	29	21	57	57	19	33.4	21.9

PSIG	TEMPERATURE °F						
	R-22	R-502	R-12	134a	R404A	R-407C	
					Saturated Vap/Liq.	Saturated Vapor	Saturated Liquid
56	31	23	58	59	20	34.9	23.4
58	32	24	60	60	22	36.4	24.9
60	34	26	62	62	23	37.8	26.3
62	35	27	64	64	25	39.2	27.8
64	37	29	65	65	26	40.6	29.2
66	38	30	67	66	27	42.0	30.6
68	40	32	68	68	29	43.3	31.9
70	41	33	70	69	30	44.6	33.3
72	42	34	71	71	32	45.9	34.6
74	44	36	73	72	33	47.8	36.5
76	45	37	74	73	34	48.4	37.1
78	46	38	76	75	35	49.6	38.4
80	48	40	77	76	37	50.8	39.6
85	51	43	81	79	40	53.7	42.6
90	54	46	84	82	42	56.5	45.4
95	56	49	87	85	45	59.2	48.2
100	59	51	90	88	48	61.8	50.9
105	62	54	93	90	50	64.3	53.5
110	64	57	96	93	52	66.7	56.0
115	67	59	99	96	55	69.1	58.4
120	69	62	102	98	57	71.4	60.8
125	72	64	104	100	59	73.6	63.0
130	74	67	107	103	62	75.8	65.3
135	76	69	109	105	64	77.9	67.5
140	78	71	112	107	66	80.0	69.6
145	81	73	114	109	68	82.0	71.7
150	83	75	117	112	70	83.9	73.7
155	85	77	119	114	72	85.8	75.7
160	87	80	121	116	74	87.7	77.6
165	89	82	123	118	76	89.5	79.5
170	91	83	126	120	78	91.3	81.3
175	92	85	128	122	80	93.1	83.2
180	94	87	130	123	82	94.8	84.9
185	96	89	132	125	83	96.5	86.7
190	98	91	134	127	85	98.1	88.4
195	100	93	136	129	87	99.8	90.1
200	101	95	138	131	88	101.4	91.8
205	103	96	140	132	90	102.9	93.4
210	105	98	142	134	92	104.5	95.0
220	108	101	145	137	95	107.4	98.1
230	111	105	149	140	98	110.3	101.1
240	114	108	152	143	101	113.1	104.1
250	117	111	156	146	104	115.9	106.9
260	120	114	159	149	107	118.5	109.7
275	124	118	163	153	111	122.3	113.7
290	128	122	168	157	115	126.0	117.6
305	132	126	172	161	118	129.5	121.3
320	136	130	177	165	122	132.9	124.9
335	139	133	181	169	126	136.2	128.4
350	143	137	185	172	129	139.4	131.8
365	146	140	188	176	132	142.5	135.0

NOTE: FOR REFRIGERANT BLENDS (HP-62, R-407C)
 To determine superheat, use saturated vapor values (small figures)
 To determine subcooling, use saturated liquid values (BOLD figures)

*Inches of Mercury

