Supplemental Instructions

Models:

T30S2D, T36S1D, T42S1D, T48S1D, T60S1D

This model provides a unique dehumidification circuit for periods of high indoor humidity conditions. Additionally an "energy recovery ventilator" may be provided to allow for outside ventilation air requirements by eliminating excessive sensible and latent loads as a result of the increased ventilation requirement.

Refer to Specification Sheet S3447 for the standard features of the base unit. Electrical data for the dehumidification models is different than the electrical data for the standard T**S1 models. Refer to Page 7 for the electrical data.

Dehumidification Circuit

The dehumidification circuit incorporates an independent heat exchanger coil in the supply air stream in addition to the standard evaporator coil. This coil reheats the supply air after it passes over the cooling coil, and is sized to nominally match the sensible cooling capacity of the evaporator coil. Extended run times in dehumidification mode can be achieved using waste heat from the refrigeration cycle to achieve the reheat process, while at the same time large amounts of moisture can be extracted from the passing air stream. Models that also have electric heaters installed have the electric heat inhibited during dehumidification mode, although it remains available for additional reheat during certain conditions. See below for specific operating sequences, and see attached tables for performance on sensible and latent capacities, water removal ratings, and supply air delivery conditions.

The dehumidification refrigerant reheat circuit is controlled by a 3-way valve directing the refrigerant gas to the normal condenser during periods when standard air conditioning is required. During periods of time of high indoor humidity, a humidistat senses the need for mechanical dehumidification. It then energizes both the compressor circuit and the 3-way valve, thus directing the hot refrigerant discharge gas into a separate desuperheating condenser circuit which reheats the conditioned air before it is delivered to the room. The refrigerant gas is then routed from the desuperheating condenser to the system condenser for further heat transfer. A small orifice inserted between the reheat coil return line and suction line will prevent liquid from accumulating in the reheat coil when it is inactive. This drain does not affect the normal operation of the system. A check valve is located in the reheat coil return line. It has a soft spring to hold the ball on the seat. Refer to Page 3 for the location of the check valve and drain back orifice. When the humidistat is satisfied, the system automatically switches back to normal A/C mode and either continues to operate or turns off based on the signal from the wall thermostat. The result is separate humidity control at minimum operating cost.

Bard Manufacturing Company, Inc.
Bryan, Ohio 43506
www.bardhvac.com

Manual: 7960-844
Supersedes: ***NEW***
Date: 10-8-19

Dehumidification Sequence of Operation

Dehumidification is controlled through the thermostat (if capable) or through a separate humidistat. On a call for dehumidification mode of operation, the compressor and 3-way valve that feeds the reheat coil are energized through circuit R-W3. Dehumidification will continue until the humidistat is satisfied.

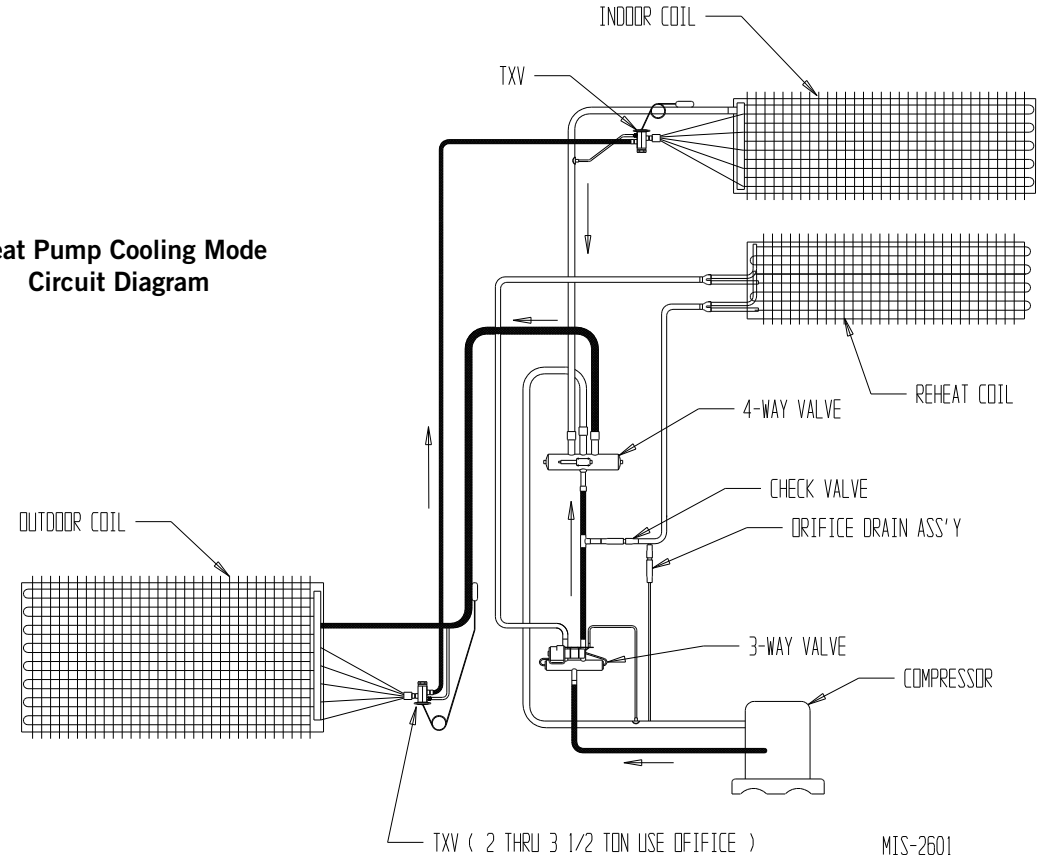
If the room temperature falls below 1st stage heating setpoint, electric heat will be energized by the room thermostat and cycle to maintain room temperature.

If 2nd stage heating setpoint is reached, dehumidification cycle is de-energized and heat pump heating is energized.

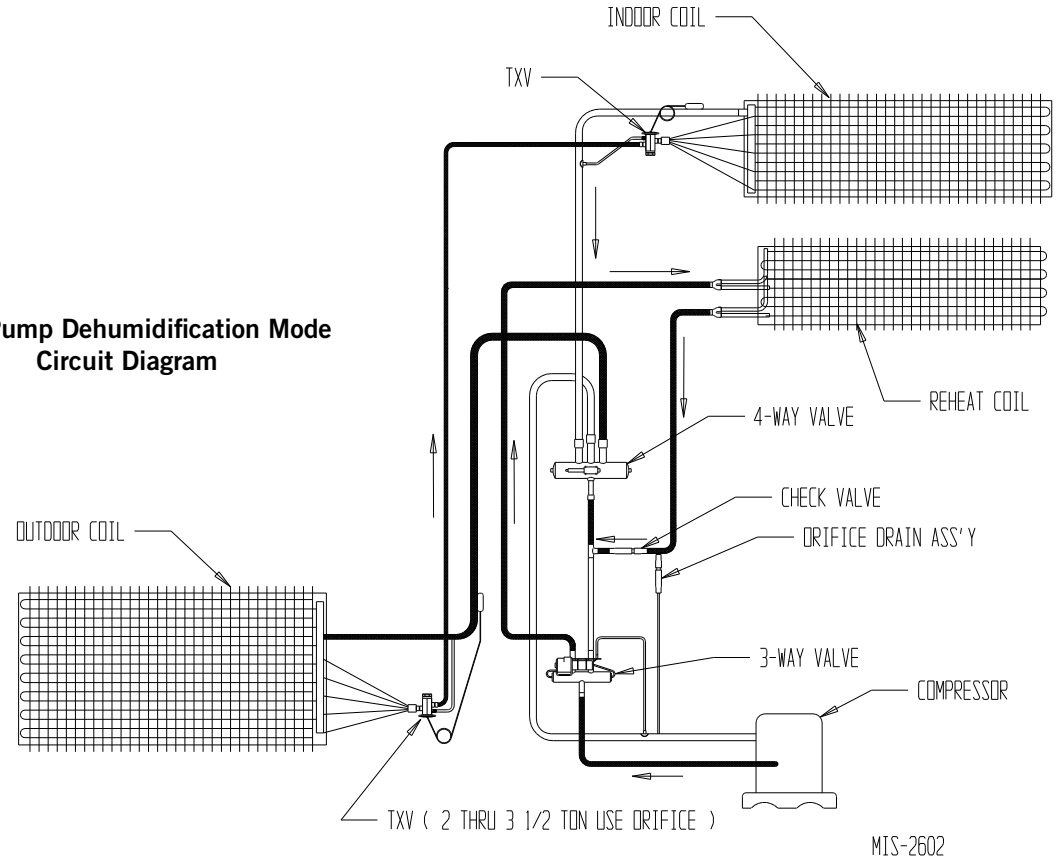
If the mixed air (return and ventilation, if used) temperature (measured at the internal filter location) drops below 65°F during dehumidification cycle, electric heat will cycle to help maintain room temperature to the 65°F condition.

Anytime there is a call for R-Y circuit, dehumidification is canceled and the unit will operate until satisfied. If dehumidification call is still present when R-Y call is satisfied, the unit will continue to operate and revert to dehumidification mode.

Heat Pump Cooling Mode Circuit Diagram



Heat Pump Dehumidification Mode Circuit Diagram



T30S2D Application Performance Data

Indoor Conditions		Outdoor Conditions	System Capacity				Pounds of Water/Hour	Evaporator Airflow	Approximate Supply Air	Mode
DB/WB	% RH	DB	Total	Sensible	Latent	S/T	Lbs.	CFM	DB/WB	A/C vs. Dehum
65/63	90	65	31,340	13,180	18,160	0.42	17.13	900	51.5 / 51.0	A/C
65/63	90	65	16,051	(-1,118)	17,169	0.00	16.2	900	66.2 / 57.5	Dehum
75/62.5	50	75	29,143	6,403	22,740	0.22	21.45	900	52.8 / 51.6	A/C
75/62.5	50	75	10,060	4,252	5,808	0.42	5.48	900	70.7 / 59.0	Dehum
75/65.5	60	75	31,241	19,947	11,294	0.64	10.65	900	55.8 / 54.8	A/C
75/65.5	60	75	12,500	2,278	10,222	0.18	9.64	900	72.8 / 61.4	Dehum
75/68	70	75	33,105	17,468	15,637	0.53	14.75	900	58.0 / 57.3	A/C
75/68	70	75	14,744	161	14,583	0.01	13.76	900	74.7 / 63.6	Dehum
80/67	50	95	3,864	(-1,199)	5,063	0.00	4.78	900	81.3 / 65.6	Dehum

T36S1D Application Performance Data

Indoor Conditions		Outdoor Conditions	System Capacity				Pounds of Water/Hour	Evaporator Airflow	Approximate Supply Air	Mode
DB/WB	% RH	DB	Total	Sensible	Latent	S/T	Lbs.	CFM	DB/WB	A/C vs. Dehum
65/63	90	65	39,773	17,117	22,656	0.43	21.37	1100	51.3 / 51.0	A/C
65/63	90	65	20,483	(-1,612)	22,095	0.00	20.84	1100	66.2 / 57.5	Dehum
75/62.5	50	75	37,395	28,861	8,534	0.77	8.05	1100	51.4 / 50.6	A/C
75/62.5	50	75	13,111	6,588	6,523	0.50	6.15	1100	69.6 / 58.6	Dehum
75/65.5	60	75	39,695	25,159	14,536	0.63	13.71	1100	54.5 / 53.9	A/C
75/65.5	60	75	17,009	3,586	13,423	0.21	12.66	1100	72.0 / 60.9	Dehum
75/68	70	75	41,414	22,024	19,390	0.53	18.29	1100	57.1 / 56.6	A/C
75/68	70	75	18,168	957	17,211	0.05	16.24	1100	74.2 / 63.6	Dehum
80/67	50	95	2,594	(-487)	3,082	0.00	2.91	1100	80.4 / 66.2	Dehum

T42S1D Application Performance Data

Indoor Conditions		Outdoor Conditions	System Capacity				Pounds of Water/Hour	Evaporator Airflow	Approximate Supply Air	Mode
DB/WB	% RH	DB	Total	Sensible	Latent	S/T	Lbs.	CFM	DB/WB	A/C vs. Dehum
65/63	90	65	44,438	18,907	25,531	0.43	24.09	1100	51.8 / 51.2	A/C
65/63	90	65	20,765	(-587)	21,352	0.00	20.14	1100	65.5 / 57.9	Dehum
75/62.5	50	75	40,262	31,532	8,730	0.78	8.24	1100	52.3 / 51.2	A/C
75/62.5	50	75	13,136	7,555	5,581	0.58	5.27	1100	69.8 / 59.1	Dehum
75/65.5	60	75	42,824	27,116	15,708	0.63	14.82	1100	55.4 / 54.4	A/C
75/65.5	60	75	15,544	4,489	11,055	0.29	10.43	1100	71.8 / 61.8	Dehum
75/68	70	75	45,445	24,140	21,305	0.53	20.1	1100	57.9 / 57.1	A/C
75/68	70	75	19,977	1,667	18,310	0.08	17.27	1100	73.9 / 63.6	Dehum
80/67	50	95	5,289	(-216)	5,505	0.00	5.19	1100	80.2 / 65.7	Dehum

Values shown in ( ) are BTUH of heat available at these conditions

T48S1D Application Performance Data

Indoor Conditions		Outdoor Conditions	System Capacity				Pounds of Water/Hour	Evaporator Airflow	Approximate Supply Air	Mode
DB/WB	% RH	DB	Total	Sensible	Latent	S/T	Lbs.	CFM	DB/WB	A/C vs. Dehum
65/63	90	65	53,748	22,691	31,057	0.42	29.30	1550	51.9 / 51.4	A/C
65/63	90	65	28,218	(-1,638)	29,856	0.00	28.17	1550	66.1 / 57.3	Dehum
75/62.5	50	75	49,295	38,697	10,598	0.79	10.00	1550	52.5 / 51.6	A/C
75/62.5	50	75	20,207	9,819	10,388	0.49	9.80	1550	69.3 / 58.3	Dehum
75/65.5	60	75	52,392	33,593	18,799	0.64	17.73	1550	55.5 / 54.7	A/C
75/65.5	60	75	24,015	5,714	18,301	0.24	17.27	1550	71.7 / 60.9	Dehum
75/68	70	75	55,457	29,604	25,853	0.53	24.39	1550	57.8 / 57.1	A/C
75/68	70	75	27,428	2,150	25,278	0.08	23.85	1550	73.7 / 63.0	Dehum
80/67	50	95	11,243	1,576	9,667	0.14	9.12	1550	79.1 / 64.9	Dehum

T60S1D Application Performance Data

Indoor Conditions		Outdoor Conditions	System Capacity				Pounds of Water/Hour	Evaporator Airflow	Approximate Supply Air	Mode
DB/WB	% RH	DB	Total	Sensible	Latent	S/T	Lbs.	CFM	DB/WB	A/C vs. Dehum
65/63	90	65	62,312	27,363	34,949	0.44	32.97	1650	50.1 / 49.9	A/C
65/63	90	65	33,100	(-289)	33,389	0.00	31.50	1650	65.2 / 56.6	Dehum
75/62.5	50	75	57,542	44,209	13,333	0.77	12.58	1650	51.0 / 50.1	A/C
75/62.5	50	75	26,138	12,483	13,655	0.48	12.88	1650	68.2 / 57.2	Dehum
75/65.5	60	75	61,912	38,922	22,990	0.63	21.69	1650	53.7 / 53.2	A/C
75/65.5	60	75	30,827	7,749	23,078	0.25	21.77	1650	70.8 / 59.8	Dehum
75/68	70	75	65,315	34,612	30,703	0.53	28.97	1650	56.0 / 55.6	A/C
75/68	70	75	34,303	3,483	30,820	0.10	29.08	1650	73.0 / 62.1	Dehum
80/67	50	95	17,289	2,543	14,746	0.15	13.91	1650	78.5 / 63.9	Dehum

Values shown in ( ) are BTUH of heat available at these conditions

TABLE 1
Dehumidification Relay Logic Board

Energize on Unit Terminal Strip	Mode	Occupied/ Unoccupied	Inputs to the Board							Outputs from the Board						
			RAT	Y	B	W2	A1	D	G	G1	BK	RV	TWV	W	YO	A2
Y, G	1st Cooling	Unoccupied		X					X	X	X				X	
Y, G, O1	1st Cooling	Occupied		X			X		X	X	X				X	X
Y, G, W3, O1	1st Cool/Dehum	Occupied		X			X	X	X	X	X				X	X
Y, G, W3	1st Cool/Dehum	Unoccupied		X				X	X	X	X				X	
Y, Y1*, G	2nd Cooling	Unoccupied		X					X	X	X				X	
Y, Y1*, G, O1	2nd Cooling	Occupied		X			X		X	X	X				X	X
Y, Y1*, G, O1, W3	2nd Cool/Dehum	Occupied		X			X	X	X	X	X				X	X
Y, Y1*, G, W3	2nd Cool/Dehum	Unoccupied		X				X	X	X	X				X	
Y, G, B	1st Heating	Unoccupied		X	X				X	X	X	X			X	
Y, G, B, O1	1st Heating	Occupied		X	X		X		X	X	X	X			X	X
Y, G, B, O1, W3	1st Heat/Dehum	Occupied		X	X		X	X	X	X	X		X	X	X	X
Y, G, B, W3	1st Heat/Dehum	Unoccupied		X	X			X	X	X	X	X			X	
Y, Y1*, B, G	2nd Heating	Unoccupied		X	X				X	X	X	X			X	
Y, Y1*, B, G, O1	2nd Heating	Occupied		X	X		X		X	X	X	X			X	X
Y, Y1*, B, G, O1, W3	2nd Heat/Dehum	Occupied		X	X		X	X	X	X	X		X	X	X	X
Y, Y1*, B, G, W3	2nd Heat/Dehum	Unoccupied		X	X			X	X	X	X	X			X	
Y, Y1*, G, B, W2	3rd Heating **	Unoccupied		X	X	X			X	X	X	X		X	X	
Y, Y1*, G, B, W2, O1	3rd Heating **	Occupied		X	X	X	X		X	X	X	X		X	X	X
Y, Y1*, G, B, W2, O1, W3	3rd Heating **	Occupied		X	X	X	X	X	X	X	X	X		X	X	X
Y, Y1*, G, B, W2, W3	3rd Heating **	Unoccupied		X	X	X		X	X	X	X	X		X	X	
B, W2, E***, G	Emergency Heat	Unoccupied			X	X			X	X	X	X		X		
B, W2, E***, G, O1	Emergency Heat	Occupied			X	X	X		X	X	X	X		X		X
B, W2, E***. G, O1, W3	Emergency Heat/Dehum	Occupied			X	X	X	X	X	X			X		X	X
B, W2, E***, G, W3	Emergency Heat/Dehum	Unoccupied			X	X		X	X	X			X		X	
W3	Dehum	Unoccupied						X		X			X		X	
W3, O1	Dehum	Occupied					X	X		X			X		X	X
W3, O1, RAT Closed	Dehum/RAT	Occupied	X				X	X		X	X		X	X	X	X
W3, RAT Closed	Dehum/RAT	Unoccupied	X					X		X	X		X	X	X	

* Y1 directly energizes the compressor solenoid; it does not go through the dehum board.
** Is only applicable to units with strip heat.
*** Is directly energized at the terminal strip of the unit; it does not go through the dehum board.

TABLE 2
Electrical Specifications

Models	Rated Volts, HZ and Phase	No. of Field Power Circuits	Single Circuit				Multiple Circuit											
			Minimum Circuit Ampacity ①	Maximum External Fuse or Circuit Breaker ②	Field Power Wire Size ③	Ground WIre Size ③	Minimum Circuit Ampacity ①			Maximum Circuit Exterior Fuse or Circuit Breaker ②			Field Power Wire Size ③			Ground WIre Size ③		
							Ckt. A	Ckt. B	Ckt. C	Ckt. A	Ckt. B	Ckt. C	Ckt. A	Ckt. B	Ckt. C	Ckt. A	Ckt. B	Ckt. C
T30S2DA00, A0Z	230/208-60-1	1	24	35	8	10												
DA04		1	45	50	8	10												
④DAS8		1	48	50	8	10												
⑦DAF8		1 or 2	65	70	6	8	24	42		35	45		8	8		10	10	
T30S2DB00, B0Z	230/208-60-3	1	16	20	12	12												
DB06		1	34	35	8	10												
DB09		1	42	45	8	10												
T30S2DC0Z	460-60-3	1	9	15	14	14												
DC06		1	18	20	12	12												
DC09		1	23	25	10	10												
T36S1DA00, A0Z	230/208-60-1	1	29	40	8	10												
DA05		1	55	60	6	10												
DA08		1 or 2	70	70	4	8	27	42		40	45		8	8		10	10	
DA10		1 or 2	80	80	4	8	27	52		40	60		8	6		10	10	
⑤DA15		1 or 2	85	90	4	8	33	52		40	60		8	6		10	10	
T36S1DB00, B0Z	230/208-60-3	1	24	30	10	10												
DB06		1	42	45	8	10												
DB09		1	50	50	6	10												
⑥DB15		1	52	60	6	10												
T36S1DC0Z	460-60-3	1	14	15	14	14												
DC06		1	23	25	10	10												
DC09		1	28	30	10	10												
⑥DC15		1	29	30	10	10												
T42S1DA00, A0Z	230/208-60-1	1	31	40	8	10												
DA05		1	57	60	6	10												
DA08		1 or 2	72	80	4	8	31	42		40	45		8	8		10	10	
DA10		1 or 2	83	90	4	8	31	52		40	60		8	6		10	10	
⑤DA15		1 or 2	86	90	3	8	34	52		40	60		8	6		10	10	
T42S1DB00, B0Z	230/208-60-3	1	26	35	8	10												
DB06		1	44	50	8	10												
DB09		1	53	60	6	10												
⑥DB15		1	53	60	6	10												
T42S1DC0Z	460-60-3	1	13	15	14	14												
DC06		1	22	25	10	10												
DC09		1	27	30	10	10												
⑥DC15		1	27	30	10	10												
T48S1DA00, A0Z	230/208-60-1	1	37	50	8	10												
DA05		1 or 2	63	70	6	8	37	26		50	30		8	10		10	10	
DA08		1 or 2	78	90	4	8	37	42		50	50		8	8		10	10	
DA10		1 or 2	89	100	3	8	37	52		50	60		8	6		10	10	
⑤DA15		1 or 2	89	100	3	8	37	52		50	60		8	6		10	10	
T48S1DB00, B0Z	230/208-60-3	1	28	40	8	10												
DB06		1	46	50	8	10												
DB09		1	55	60	6	10												
⑥DB15		1	55	60	6	10												
T48S1DC0Z	460-60-3	1	14	20	12	12												
DC06		1	23	25	10	10												
DC09		1	28	30	10	10												
⑥DC15		1	29	30	10	10												
T60S1DA00, A0Z	230/208-60-1	1	45	60	8	10												
DA05		1 or 2	71	80	4	8	45	26		50	30		8	10		10	10	
DA10		1 or 2	97	100	3	8	45	52		50	60		8	6		10	10	
⑤DA15		1 or 2	97	100	3	8	45	52		50	60		8	6		10	10	
⑤DA20		1 or 3	113	125	2	6	45	52	26	50	60	30	8	6	10	10	10	10
T60S1DB00, B0Z	230/208-60-3	1	32	45	8	10												
DB09		1	59	60	6	10												
⑥DB15		1	59	60	6	10												
⑥DB18		2	N/A	N/A	N/A	N/A	59	28		60	30		6	10		10	10	
T60S1DC0Z	460-60-3	1	15	20	12	12												
DC06		1	29	30	10	10												
⑥DC15		1	30	30	10	10												
⑥DC18		1	34	35	8	10												

① These "Minimum Circuit Ampacity" values are to be used for sizing the field power conductors. Refer to the National Electrical Code (latest version), Article 310 for power conductor sizing.

CAUTION: When more than one field power circuit is run through one conduit, the conductors must be derated. Pay special attention to note 8 of Table 310 regarding Ampacity Adjustment Factors when more than three (3) conductors are in a raceway.

② Maximum size of the time delay fuse or circuit breaker for protection of field wiring conductors.

③ Based on 75°C copper wire. All wiring must conform to the National Electrical Code and all local codes.

④ Maximum KW that can operate with the heat pump on is 4KW. Full heat available during Emergency Heat Mode.

⑤ Maximum KW that can operate with the heat pump on is 10KW. Full heat available during Emergency Heat Mode.

⑥ Maximum KW that can operate with the heat pump on is 9KW. Full heat available during Emergency Heat Mode.

⑦ Maximum KW that can operate with the heat pump on is 8KW. Full heat available during Emergency Heat Mode.

IMPORTANT: While this electrical data is presented as a guide, it is important to electrically connect properly sized fuses & conductor wires in accordance with the National Electrical Code & all local codes.