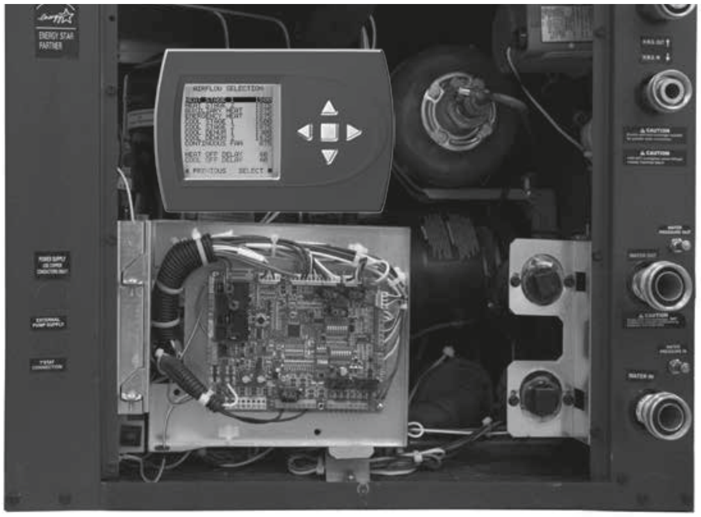
ClimateMaster
Geothermal Heating & Cooling

Tranquility® Digital (DXM2) Troubleshooting Guide



DIGITAL Geothermal
Heat Pumps
TE/TZ/TES/TEP

97B0601N01

Rev.: 3/10/15

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Introduction

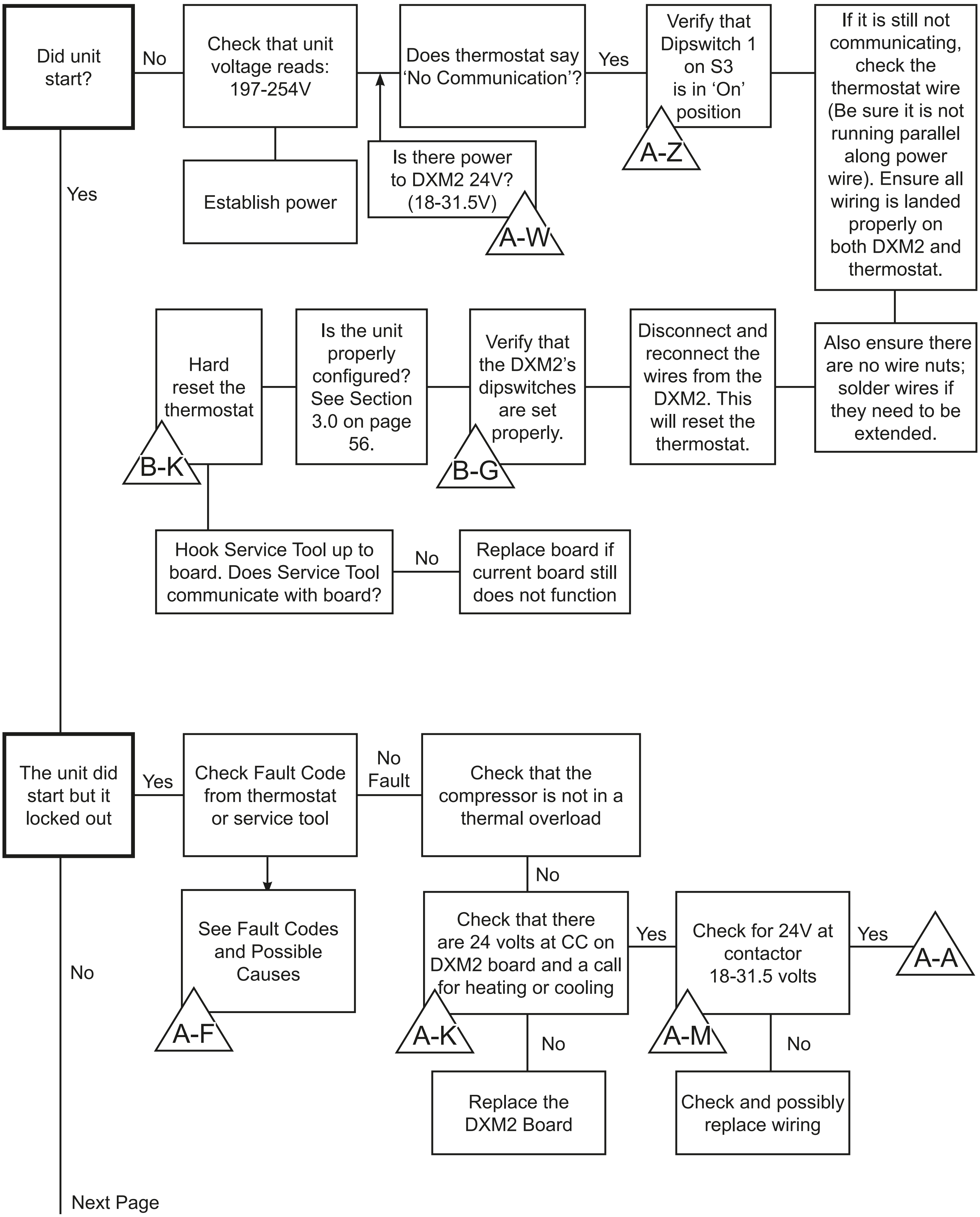
Troubleshooting ClimateMaster Tranquility® Digital Packaged Heat Pumps is quite straightforward.

Most problems relate to water flow. Either there isn't enough water flow or the entering water temperature is improperly supplied. Most service problems can be addressed without refrigerant gauges. In fact, installing gauges on packaged heat pumps can do more harm than good because packaged heat pumps contain less refrigerant compared to split systems. The first thing to do is always perform a water side check (Heat of Extraction for Heating or Heat of Rejection for Cooling) to determine if the unit is operating properly.

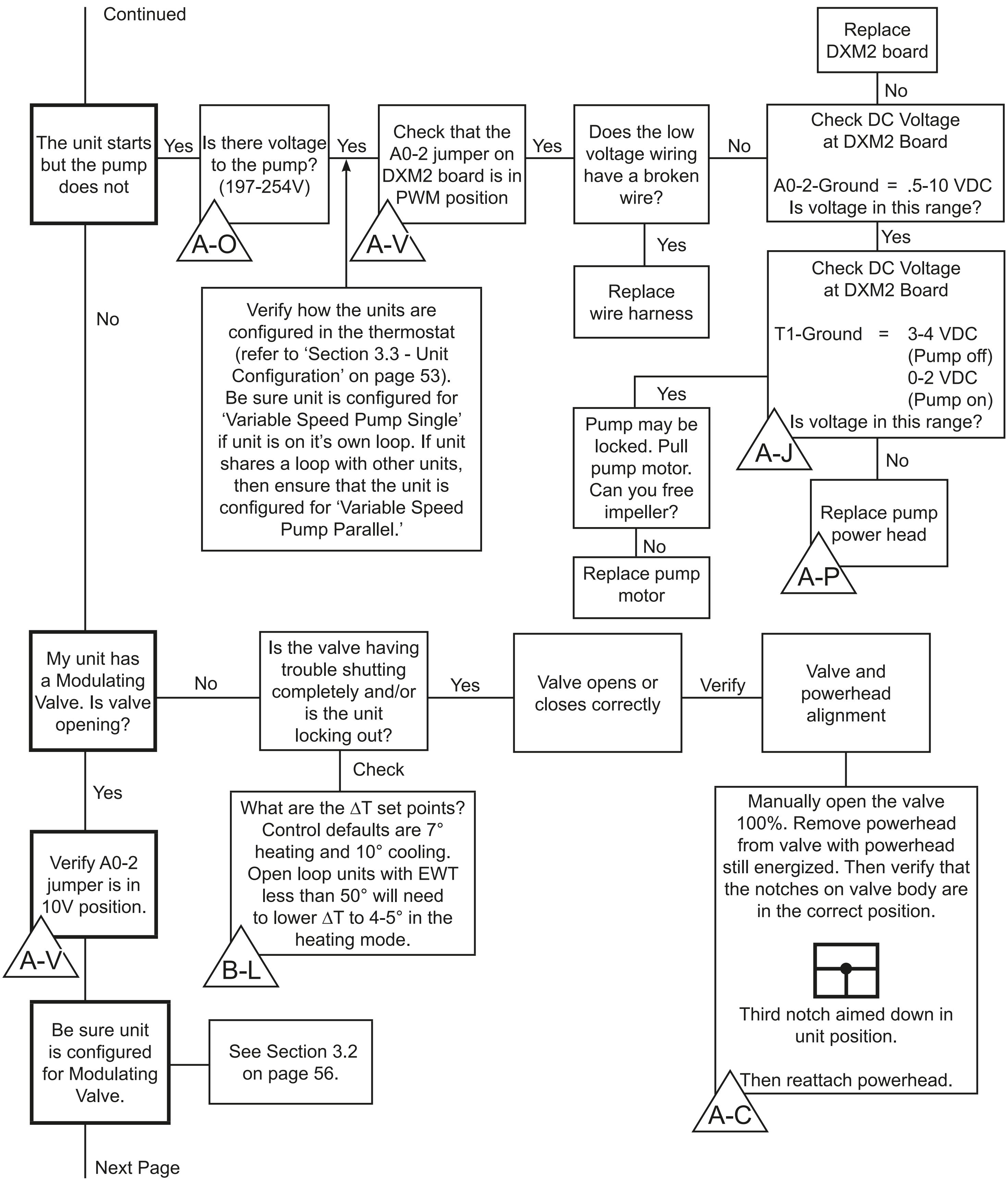
Set up and diagnostics are made easier using the communicating thermostat (ATC32) or the communicating service tool (ACDU02). You must have ATC32 or ACDU02 to properly work on ClimateMaster Tranquility® Digital units that use the DXM2 control board.

Follow the flow chart on the following pages to help diagnose and solve your issue.

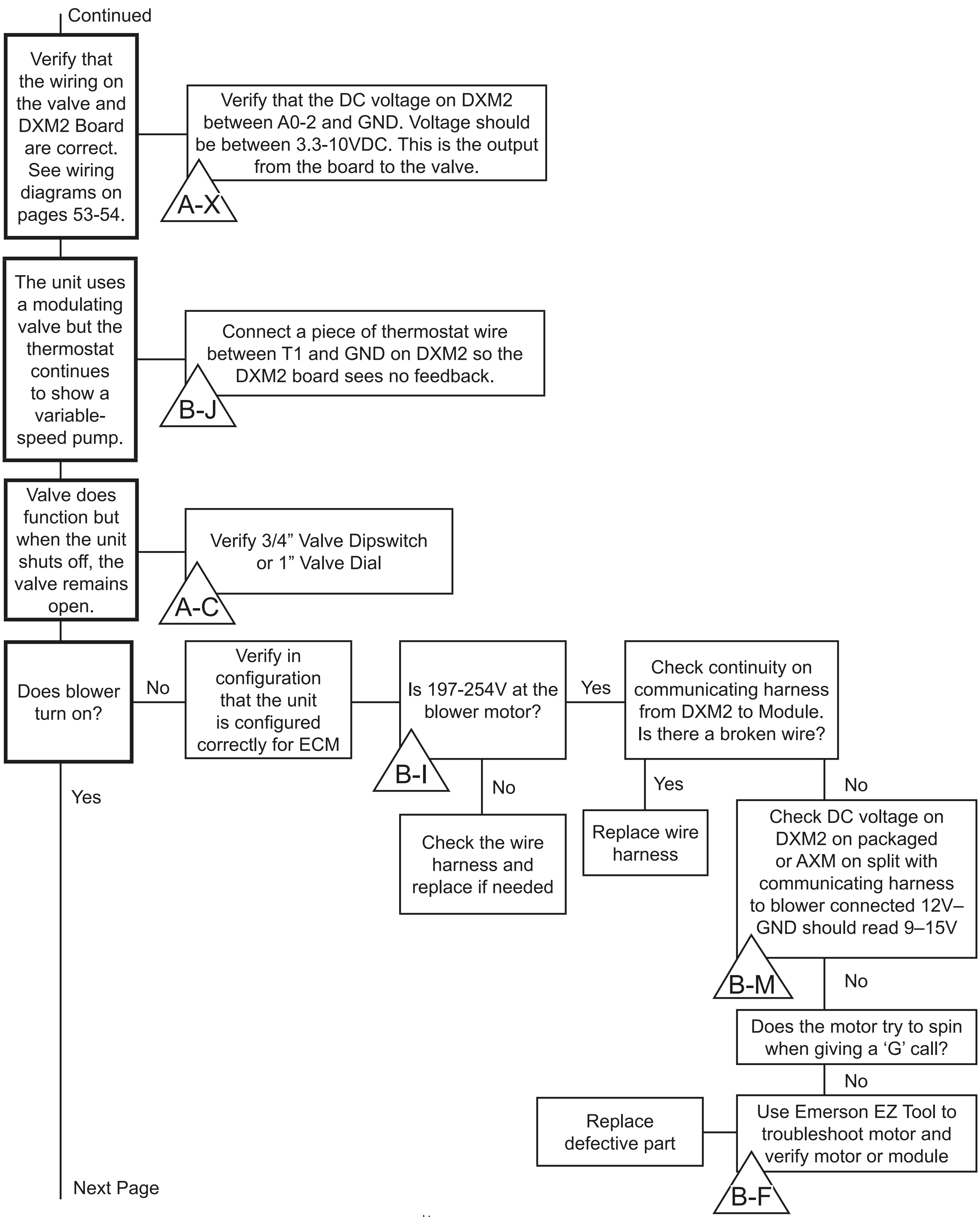
Troubleshooting Flow Chart



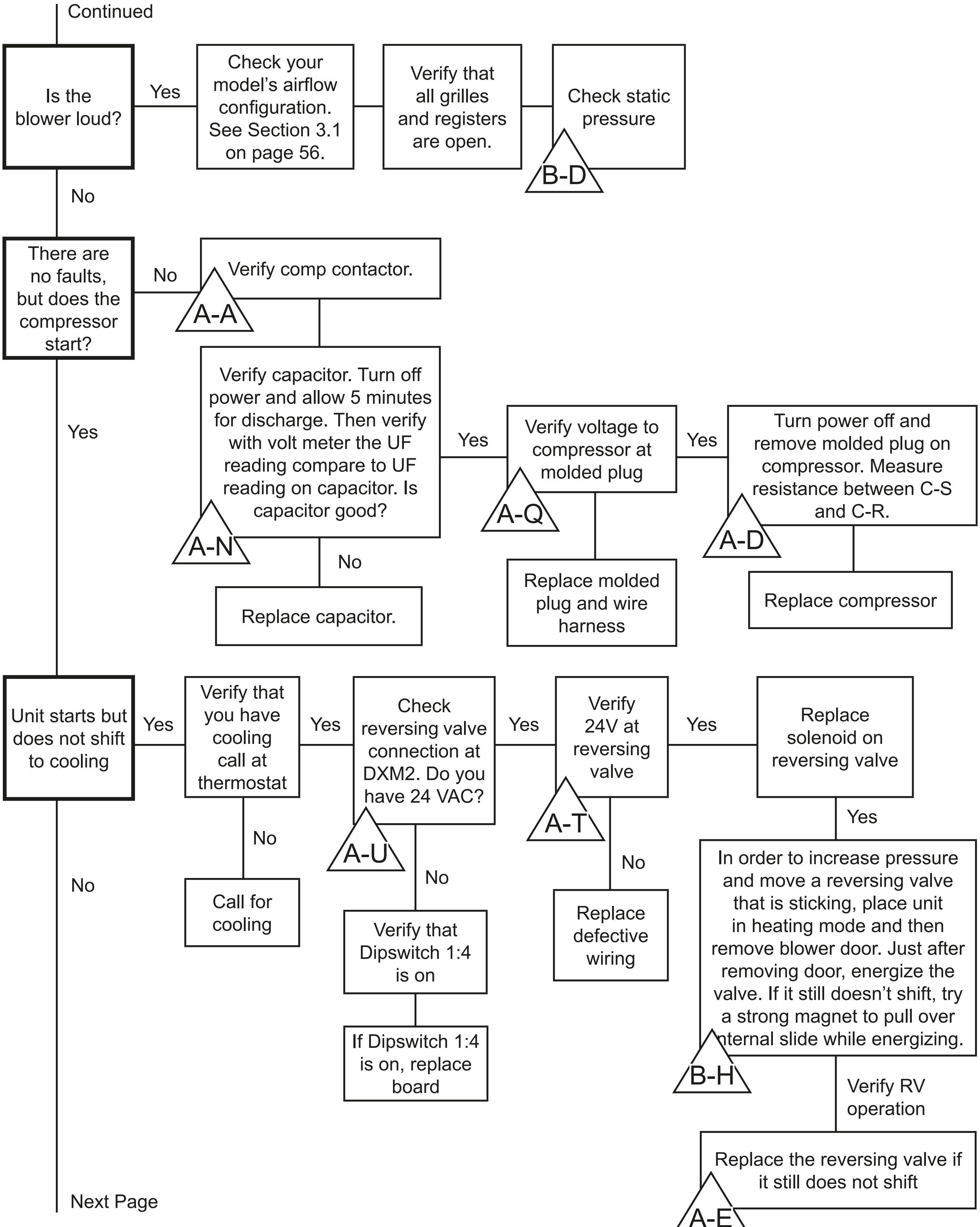
Troubleshooting Flow Chart



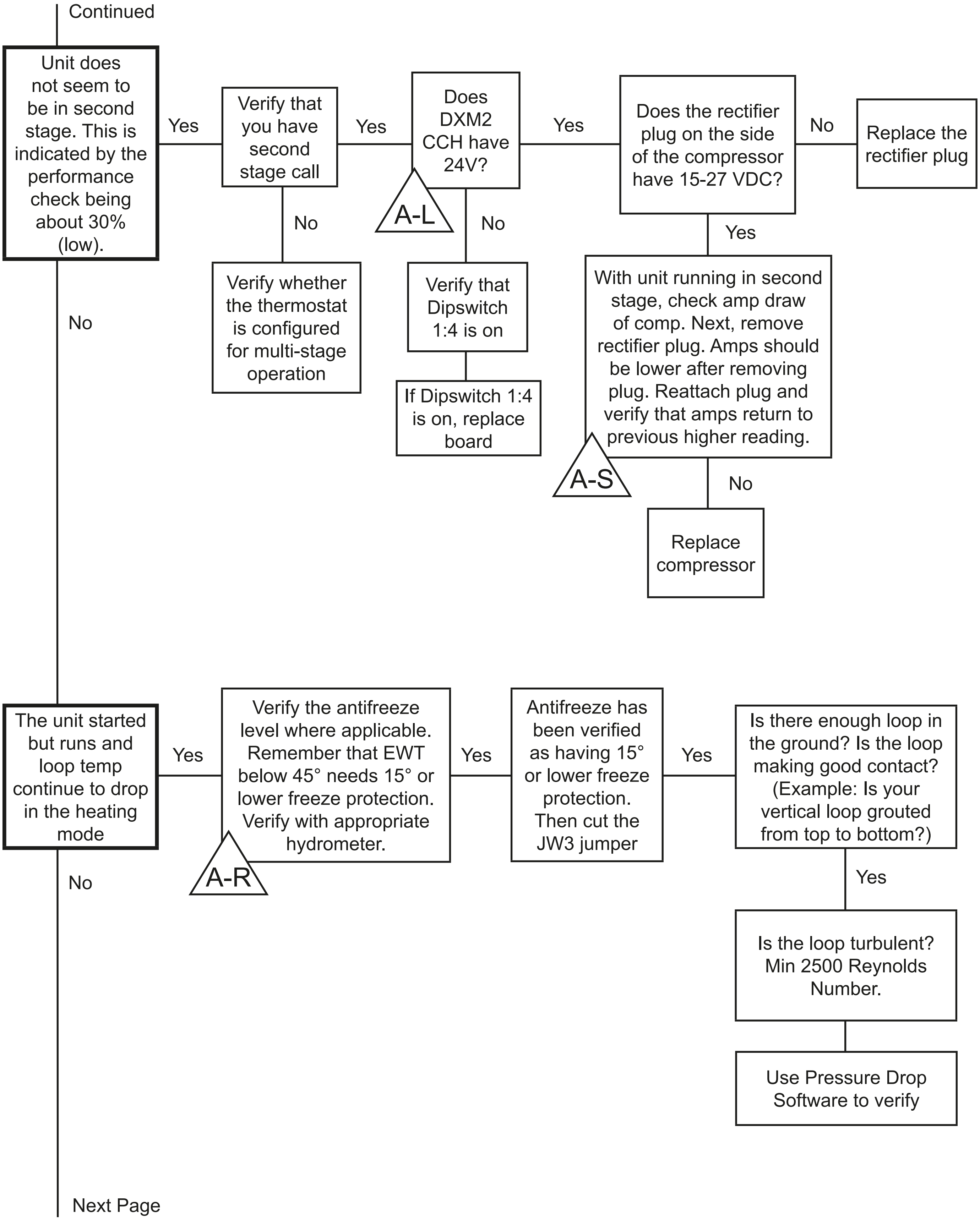
Troubleshooting Flow Chart



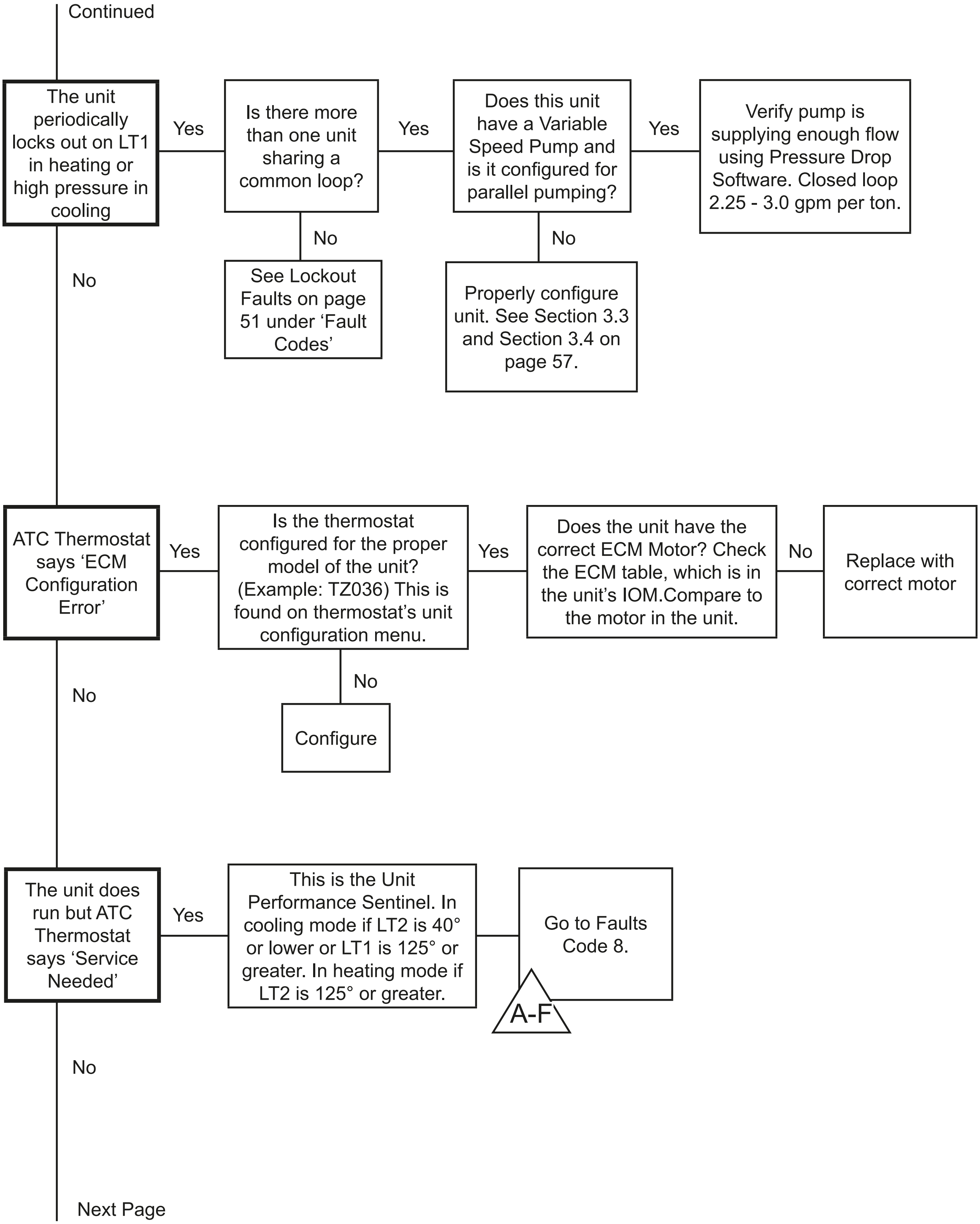
Troubleshooting Flow Chart



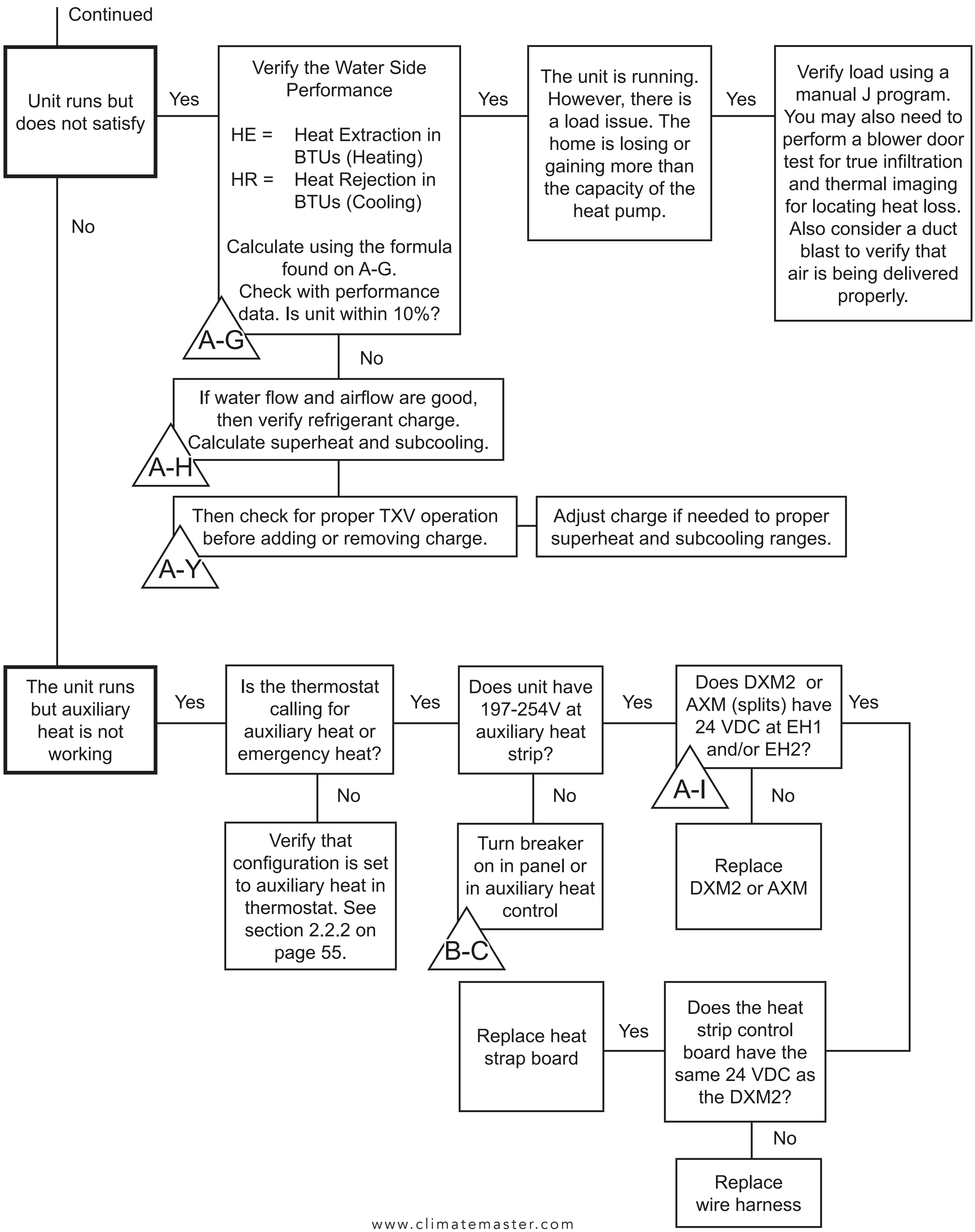
Troubleshooting Flow Chart



Troubleshooting Flow Chart



Troubleshooting Flow Chart



Notes: Specific to Splits

1. When using TES/TEP with communicating Air Handlers (and not using ATC32U02 Thermostat using a 24 volt stat) you must mount stat at Air Handler or unit. For proper communicating between TES/TEP, an Air Handler, ATC32U02 should be placed in the OFF position when not using it as a service tool. B-R

2. When configuring TES or TEP after a board change be sure of correct blower type. Select NONE on tool or thermostat because there is no blower directly connected to the DXM2.

3. TAH Air Handlers can be changed to operate blower on 115 volts instead of 230 volts. Be sure NOT to connect the supplied jumper to other opp. molex plug unless you truly want 115 volts. B-N

4. When installing LT2 Sensor on cased coil or other manufacturer Air Handler, be sure it is installed between TXV and distributor tubes. If you can not install the sensor in that location then do not install the sensor any where else on the coil and leave jumper on DXM2 board. B-O

5. Ensure that TXV bulb is strapped outside of the Air Handler or Cased Coil on the suction line and that the TXV bulb is insulated. B-P

6. All TES/TEP units come factory charged for an additional 25 feet of lineset. Be sure to add or subtract from this based on your lineset length. Final verification is looking at superheat and subcooling numbers against operating parameters in IOM. B-Q

7. On AXM in TAH Air Handler, the only dipswitch used is #2, which can be used for dehumidification. On the AXM, “ON” is Normal and “OFF” is Dehumidification.

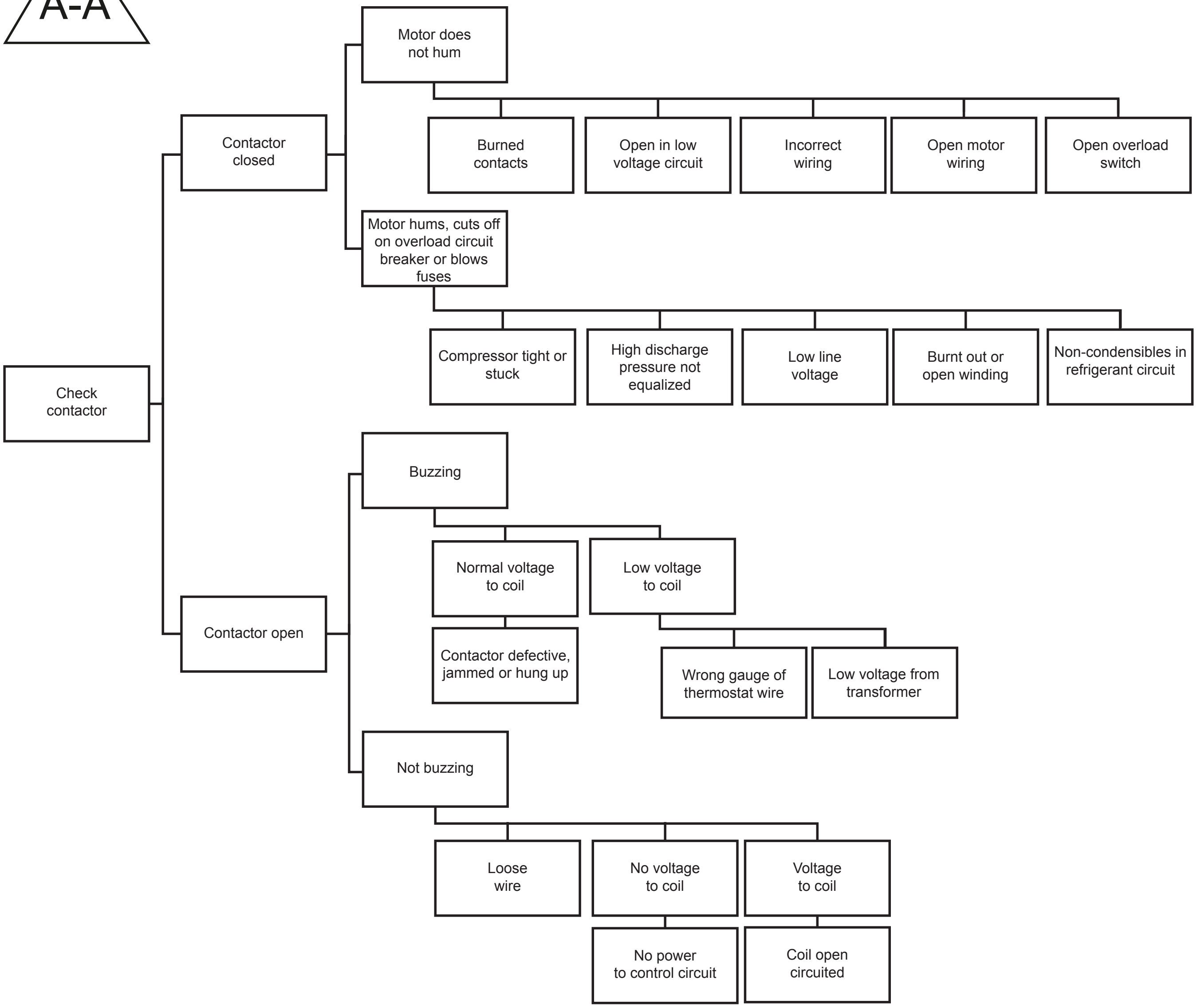
8. When brazing a lineset, use Nitrogen flow to prevent oxidation and carbon build up, because these things can restrict the TXVs. Also, protect service valves with a wet rag or heat block to prevent overheating and causing damage. Always install a biflow filter drier in lineset.

9. For reference connecting low voltage wiring when using other Air Handlers or gas furnace in duel fuel applications, see B-S. B-S

Reference Symbols and Diagrams for Flow Chart

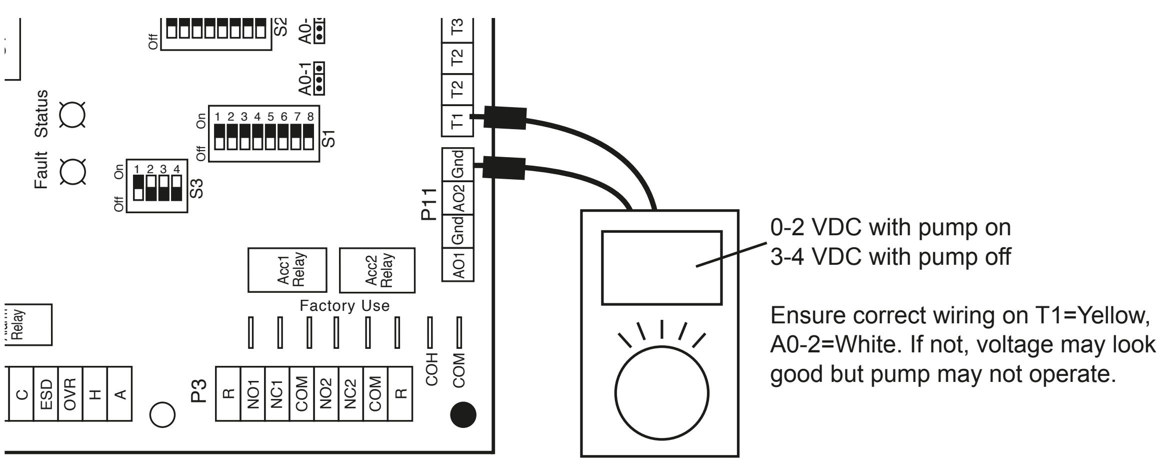
Contactor Chart

A-A



Verifying Pump Feedback Signal

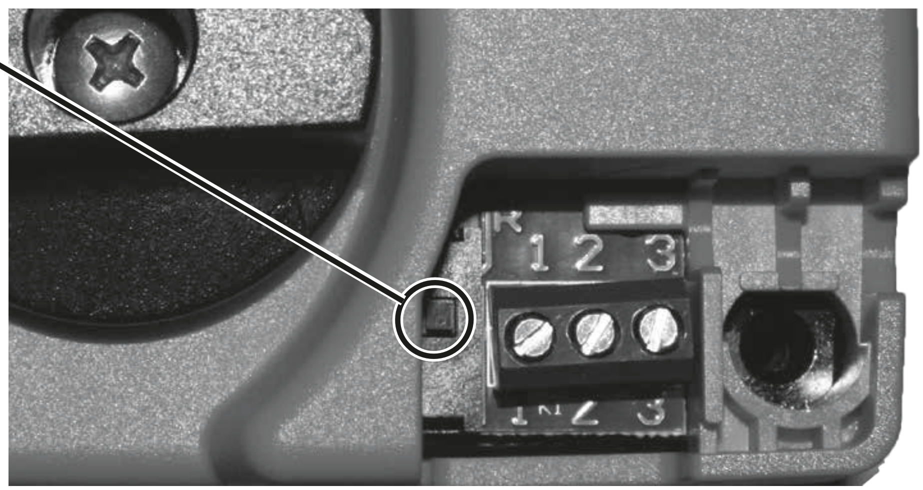
A-B

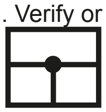


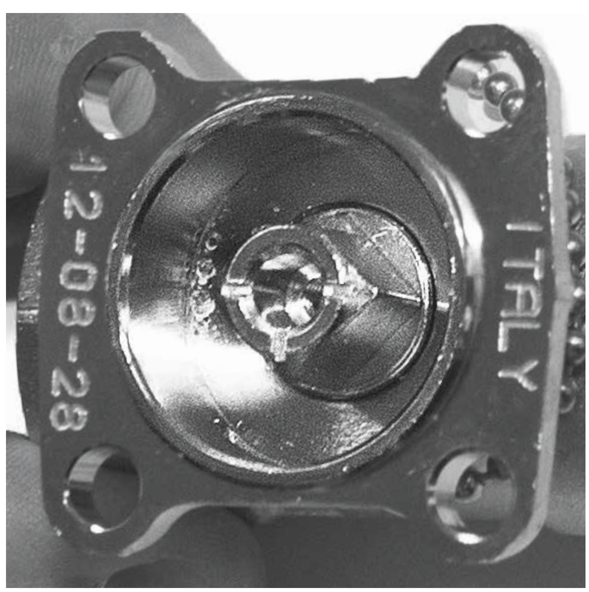
Removing Powerhead on ¾-Inch Modulating Valve

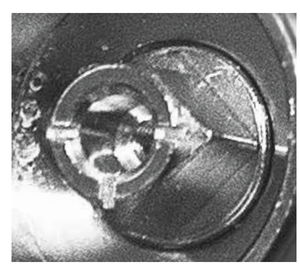
A-C

On 3/4” valve, be sure that dip switch is moved up or toward center of valve and valve closes.

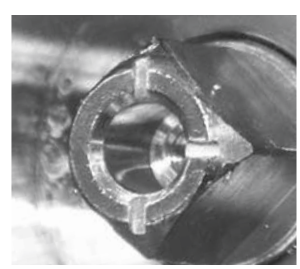


For Proper Valve-to-Head Alignment
Before removing power head, go to manual mode and open valve to 100%. Stay on that screen and with the valve powered open, remove power head. Verify or rotate physical valve to the  position.





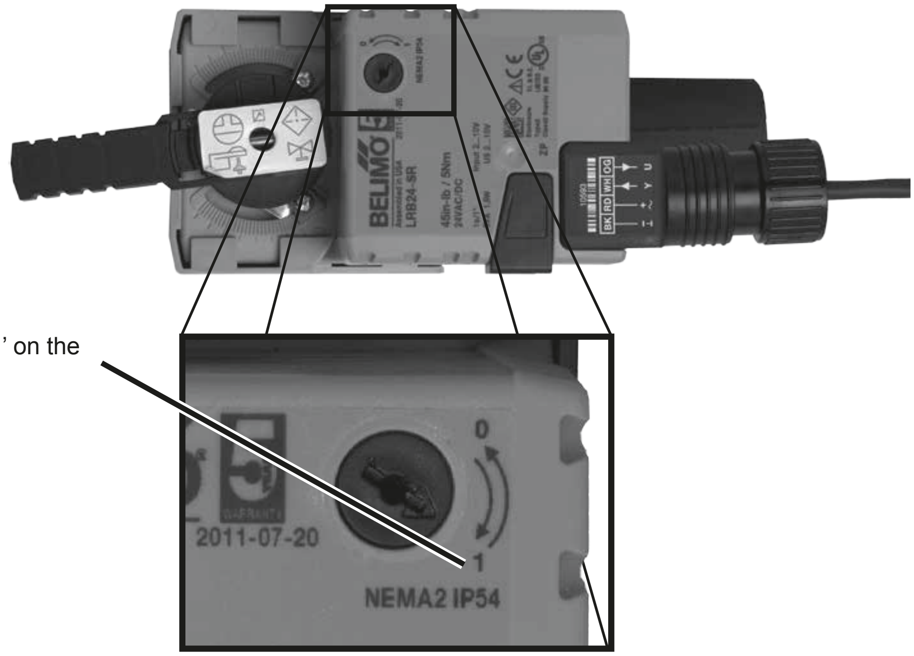
Open



Closed

A-C

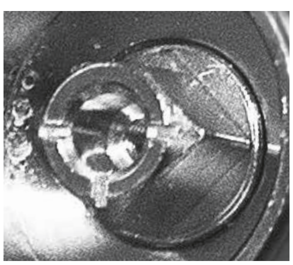
Removing Powerhead on 1-Inch Modulating Valve



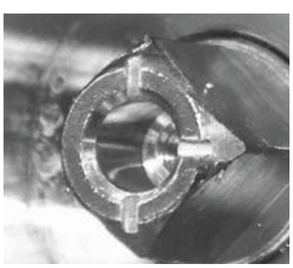
1) Rotate dial to ‘1’ on the 1-Inch valve.

2) The 1-inch valve includes a tool to remove the power head.

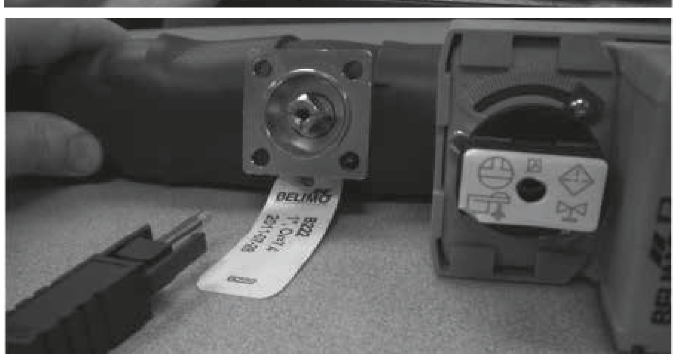
   See previous page for proper valve-to-head alignment.



Open



Closed



Checking Compressors

A-D

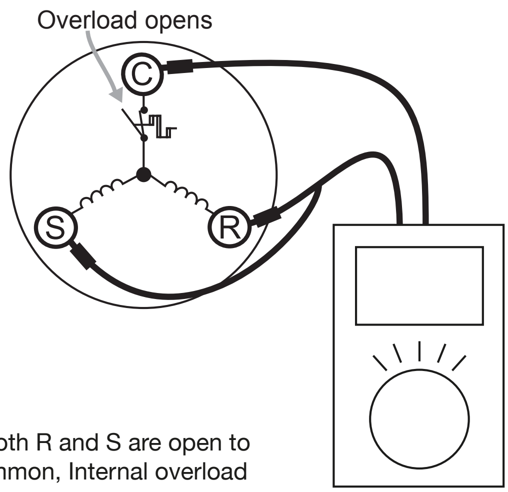
Compressor Ohms Table

Compressor	C-S Ohms	C-R Ohms	Unit	
ZPS20	1.64	1.30	TZ024, TE026	TEP/TES026
ZPS30	1.52	0.88	TZ036, TE038	TEP/TES038
ZPS40	1.86	0.52	TZ048, TE049	TEP/TES049
ZPS51	1.68	0.41	TZ060, TE064	TEP/TES064
ZPS60	1.85	0.34	TE072	
ZPS26	1.90	1.02	TZ030	
ZPS35	1.55	0.62	TZ042	

Note: Readings are good ± 7%

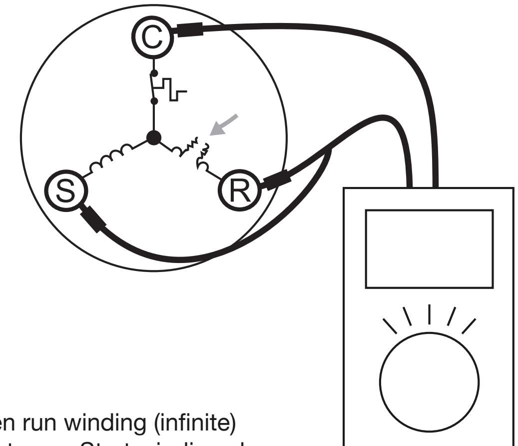
Note: Reading S-R = C-S + C-R Readings
Example: ZPS20 S-R = 2.94 Ohms

Compressor with Open Internal Overload



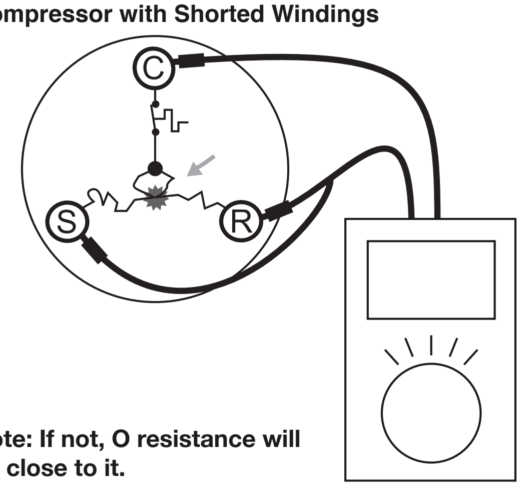
If both R and S are open to common, Internal overload is open.

Compressor with Open Run Winding



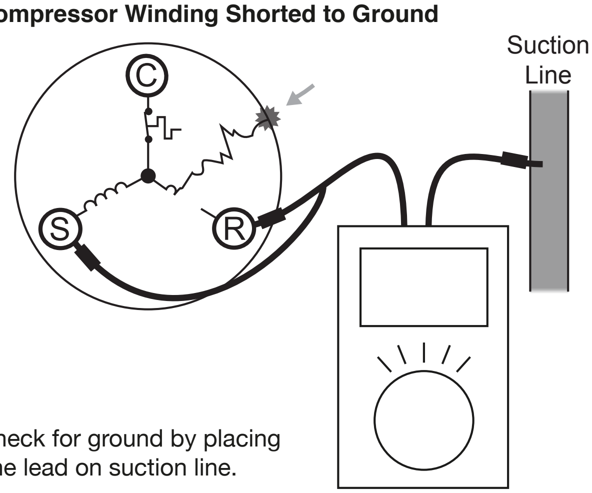
Open run winding (infinite) resistance. Start winding shows measurable resistance.

Compressor with Shorted Windings



Note: If not, O resistance will be close to it.
C-S and C-R will have high resistance above 3 ohms.

Compressor Winding Shorted to Ground



Check for ground by placing one lead on suction line.

A-D

An Alternative Way of Checking Compressors

Megohm Values of Copeland Compressors

For years servicemen have used megohmeters to evaluate compressor motor windings. However, most megohmeter manufacturers publish guidelines that apply to open motors. For this reason, Emerson Climate Technologies has investigated the use of megohmeters on hermetic and semi-hermetic compressors.

When using megohmeters to evaluate the motor insulation of compressors, it is important to understand that they should not be used as one would a volt-ohm meter. A single megohmeter reading gives little insight into the condition of a motor's insulation.

Megohmeters are best used as a part of a regular maintenance program to monitor trends (over several months). For example, one might record a megohm value and compare it to a previous reading. If subsequent readings show a trend of lower and lower values, then corrective action (such as system clean up) should be taken.

Emerson does not incorporate the megohmeter into any of its quality checks. All Copeland® compressors must pass U.L. required tests using hi-potential current leakage testers ("hi-pot"). Studies performed by Emerson have found that compressors with megohmeter readings as low as 0.5 megohms still pass the hi-pot.

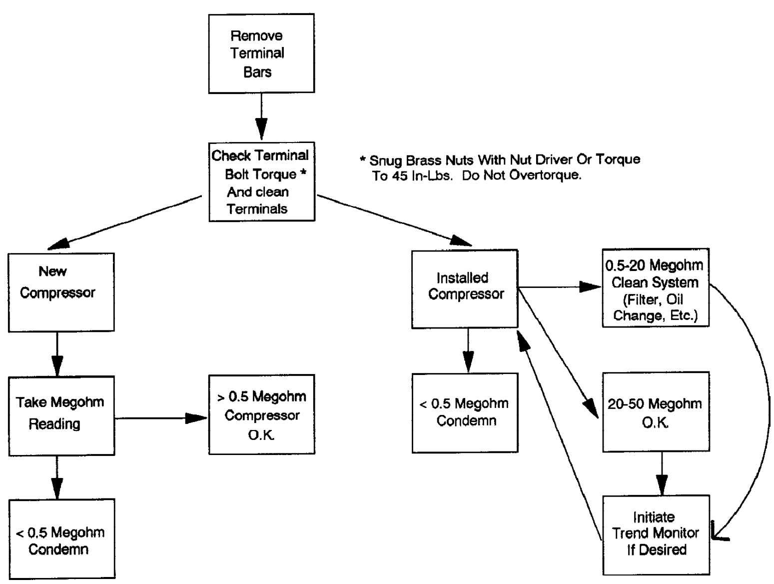
There are many factors that affect megohm readings including contaminated refrigerant, oil level, refrigerant in oil and current leakage through electrical fusites or terminal plates.

Any external electrical components connected to the compressor terminals also affect megohm readings. Wires, contactors and relays all leak current and will decrease compressor megohmeter readings if not disconnected.

As mentioned earlier a single megohm reading cannot be used to condemn a compressor since many other factors are involved. However, limits can be placed on megohm values that dictate action be taken. Emerson has found that these limits are related to the rated voltage of the compressor. Megohm values equal to or greater than 1000 ohms per volt are probably acceptable. For example, a 460 volt compressor might show a megohm reading of 460,000 ohms or 0.46 megohm. Compressors with rated voltages of 208 to 230 volts would then be operable at megohm values of 0.208 to 0.230 megohms; for simplicity, Emerson has set the limit at 0.5 megohms before a compressor is condemned. Figure 1 shows the required procedure for checking compressors with a megohmeter.

New compressors that have never been installed will not need any system clean-up procedures so long as the megohm reading is above 0.5. A baseline reading must be established for comparison purposes and since this is its fi rst reading this will be its baseline value.

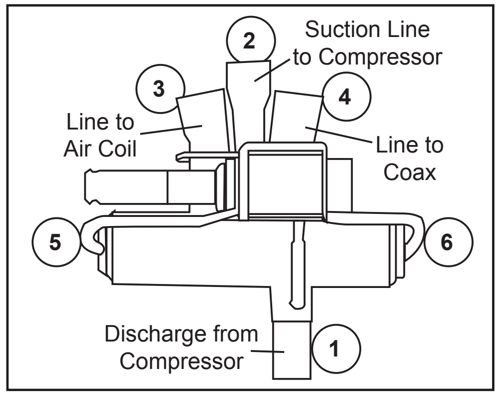
Megohmmeter



Megohmeter Test Procedure

Reversing Valve Touch Test Chart

A-E



VALVE OPERATING CONDITION	1	2	3	4	5	6	Possible causes	Corrections
	NOTES: * Temperature of Valve Body ** Warmer than Valve Body							
	NORMAL OPERATION OF VALVE							
Normal COOLING	Hot	Cool	Cool 23 (2)	Hot 23 (7)	TVB	*TVB		
Normal HEATING	Hot	Cool	Hot 23 (1)	Cool 23 (2)	TVB	*TVB		
	MALFUNCTION OF VALVE						Possible causes	Corrections
Valve will not shift from heat to cool	Check electrical circuit and coil						No Voltage to coil	Repair electrical circuit
							Defective coil (No resistance)	Replace coil
	Check refrigeration charge						Low charge	Repair leak, recharge system
							Pressure differential too high	Recheck system
	Hot	Cool	Hot 23 (1)	Cool 23 (2)	Hot	*TVB	Pilot valve okay. Dirt in one bleeder hose.	Deenergize solenoid, raise head pressure and reenergize solenoid to break dirt loose. If unsuccessful, remove valve and clean out. Check on air before installing if not movement, reduce valve, add strainer to decharge tube and mount valve horizontally
							Platon cup leak	Stop unit. After pressure equalizes, restart with solenoid energized. If valve shifts, restart with compressor running. If still no shift, replace valve.
	Hot	Cool	Hot 23 (1)	Cool 23 (2)	Hot	*TVB	Clogged pipe tubes.	Raise head pressure, operate solenoid to free. If still no shift, replace valve
	Hot	Cool	Hot 23 (1)	Cool 23 (2)	Hot	Hot	Both parts of pilot open. (Back seat port did not close)	Raise head pressure, operate solenoid to free partially clogged port. If still no shift, replace valve.
	Warm	Cool	Warm 23 (1)	Cool 23 (2)	Warm	TVB	Defective compressor	
Start to shift but does not complete reversal	Hot	Warm	Warm	Hot	*TVB	Hot	Not enough pressure differential at start of stroke or not enough flow to maintain pressure differential.	Check unit for correct operating pressures and charge. Raise head pressure. If no shift, use valve with smaller ports.
							Body damage.	Replace valves.
	Hot	Warm	Warm	Hot	Hot	Hot	Both parts of pilot open.	Raise head pressure, operate solenoid. If no shift, replace valve.
	Hot	Hot	Hot	Hot	*TVB	Hot	Body damage.	Replace valve.
							Valve hung up at mid-stroke. Pumping volume of compressor not sufficient to maintain reversal.	Raise head pressure, operate solenoid. If no shift, use valve with smaller ports.
	Hot	Hot	Hot	Hot	Hot	Hot	Both parts of pilot open.	Raise head pressure. Operate solenoid. If no shift, replace valve.
Apparent lock in cooling	Hot	Cool	Cool 23 (2)	Hot 23 (1)	**WVB	*TVB	Pilot needle on end of side leaking.	Operate valve several times then recheck. If excessive leak, replace valve.
	Hot	Cool	Cool 23 (2)	Hot 23 (1)	**WVB	**WVB	Pilot needle and piston needle leaking	Operate valve several times then recheck. If excessive leak, replace valve.
Will not shift cool to heat	Hot	Cool	Cool 23 (2)	Hot 23 (1)	TVB	TVB	Pressure differential too high	Stop unit. Will reverse during equalization period. Recheck system.
							Clogged pilot tube	Raise head pressure. Operate solenoid to free dirt. If still no shift, replace valve.
	Hot	Cool	Cool 23 (2)	Hot 23 (1)	TVB	Hot	Dirt in bleeder hole	Raise head pressure. Operate solenoid. Replace valve.
							Piston cup leak	Stop unit. After pressures equalize, restart with solenoid deenergized. If valve shifts, reattempt with compressor running. If it still will not reverse while running, replace valve.
	Hot	Cool	Cool 23 (2)	Hot 25 (1)	Hot	Hot	Defective pilot.	Replace valve.
	Warm	Cool	Cool 23 (2)	Warm 25 (1)	*TVB	Warm	Defective compressor.	

A-F

Performance Troubleshooting

Symptom	Htg	Clg	Possible Cause	Solution
Insufficient Capacity/ Not Cooling or Heating Properly	X	X	Dirty filter	Replace or clean
	X		Rduced or no air flow in heating	Check for dirty air filter and clean or replace
				Check fan motor operation and airflow restrictions
				Too high of external static - check static vs blower table
		X	Reduced or no air flow in cooling	Check for dirty air filter and clean or replace
				Check fan motor operation and airflow restrictions
				Too high of external static - check static vs blower table. See B-D.
	X	X	Leaky duct work	Check supply and return air temperatures at the unit and at distant duct registers if significantly different, duct leaks are present. Have a duct blast test performed.
	X	X	Low refrigerant charge	Check superheat and subcooling per chart
	X	X	Restricted metering device	Check superheat and subcooling per chart - replace if restriction. Both SH and SC will be high.
		X	Defective reversing valve	Perform RV touch test
	X	X	Thermostat improperly located	Check location and for air drafts behind stat
	X	X	Unit undersized	Recheck loads & sizing check sensible clg load and heat pump capacity
	X	X	Scaling in water heat exchanger	Perform Scaling check and clean if necessary
	X	X	Inlet water too hot or cold	Check load, loop sizing, loop backfill, ground moisture.
High Head Pressure	X		Reduced or no air flow in heating	Check for dirty air filter and clean or replace
				Check fan motor operation and airflow restrictions
				Too high of external static - check static vs blower table. See B-D.
		X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting Check water flow adjust to proper flow rate
		X	Inlet water too hot	Check load, loop sizing, loop backfill, ground moisture
	X		Air temperature out of range in heating	Bring return air temp within design parameters
		X	Scaling in water heat exchanger	Perform Scaling check and clean if necessary
	X	X	Unit over charged	Check superheat and subcooling - reweigh in charge
	X	X	Non-condensables insystem	Vacuum system and reweigh in charge. Vacuum to min 500 microns.
	X	X	Restricted metering device	Check superheat and subcooling per chart - replace
Low Suction Pressure	X		Reduced water flow in heating	Check pump operation or water valve operation/setting
				Plugged strainer or filter - clean or replace
				Check water flow adjust to proper flow rate. Pump or value ΔT.
	X		Water temperature out of range	Bring water temp within design parameters
		X	Reduced air flow in cooling	Check for dirty air filter and clean or replace
				Check fan motor operation and airflow restrictions
				Too high of external static - check static vs blower table
		X	Air temperature out of range	Too much cold vent air - bring entering air temp within design parameters
	X	X	Insufficient charge	Check for refrigerant leaks
Low Dischage Air Temperature in Heating	X		Too high of air flow	Check fan motor speed selection and airflow chart
	X		Poor performance	See “Insufficient Capacity”
High Humidity		X	Too high of air flow	Check fan motor speed selection and airflow chart. Return air temp may be too low.
		X	Unit oversized	Recheck loads and sizing check sensible clg load and heat pump capacity

Performance Troubleshooting

A-F

Symptom	Htg	Clg	Possible Cause	Solution
Only Compressor Runs	X	X	Thermostat wiring	Check G wiring at heat pump. Jumper G and R for fan operation.
	X	X	Fan motor relay	Jumper G and R for fan operation. Check for Line voltage across blower relay contacts.
				Check fan power enable relay operation (if present)
	X	X	Fan motor	Check for line voltage at motor. Check capacitor
	X	X	Thermostat wiring	Check thermostat wiring at or DXM2. Put in Test Mode and then jumper Y1 and W1 to R to give call for fan, compressor and electric heat.
Unit Doesn't Operate in Cooling		X	Reversing Valve	Set for cooling demand and check 24VAC on RV coil.
				If RV is stuck, run high pressure up by reducing water flow and while operating engage and disengage RV coil voltage to push valve.
		X	Thermostat setup	For DXM2 check for “O” RV setup not “B” if uses conv stat.
		X	Thermostat wiring	Check O wiring at heat pump. DXM2 requires call for compressor to get RV coil “Click.”
Modulating Valve Troubleshooting	X	X	Improper output setting	Verify the AO-2 jumper is in the 0-10V position
			No valve output signal	Check DC voltage between AO2 and GND. Should be 0 when valve is off and between 3.3v and 10v when valve is on.
			No valve operation	Check voltage to the valve
				Replace valve if voltage and control signals are present at the valve and it does not operate

A-F

Functional Troubleshooting

Fault	Htg	Clg	Possible Cause	Solution
Main Power Problems	X	X	Green status LED off	Check Line Voltage circuit breaker and disconnect between 197-254 volts
				Check for line voltage between L1 and L2 on the contactor
				Check for 24VAC between R and C on DXM 18-31.5
				Check primary/secondary voltage on transformer
HP Fault Code 2 High Pressure		X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting
				Check water flow adjust to proper flow rate
		X	Water temperature out of range in cooling	Bring water temp within design parameters. Water is too warm.
	X		Reduced or no air flow in heating	Check for dirty air filter and clean or replace
				Check fan motor operation and airflow restrictions
				Dirty air coil- construction dust etc.
				Too high of external static. Check static vs blower table
	X		Air temperature out of range in heating	Bring return air temp within design parameters
	X	X	Overcharged with refrigerant	Check superheat/subcooling vs typical operating condition table
	X	X	Bad HP switch	Check switch continuity and operation - Replace
	X		Frozen water heat exchanger	Thaw heat exchanger (water pressure switches).
	X	X	Bad HPWS Switch	Replace HPWS Switch. See B-A.
LP/LOC Fault-Code 3 Low Pressure/ Loss of Charge	X	X	Insufficient charge	Check for refrigerant leaks
	X		Compressor pump down at start-up	Check charge and start-up water flow
LT1 Fault - Code 4 Water Low Temperature	X		Reduced or no water flow in heating	Check pump operation or water valve operation/setting
				Plugged strainer or filter - clean or replace
				Check water flow adjust to proper flow rate
	X		Inadequate anti-freeze level	Check antifreeze specific gravity with hydrometer. See A-R.
	X		Improper low temperature setting (30°F vs 10°F)	Clip JW3 (LT1) jumper for antifreeze use. Be sure loop has 15° freeze protection
	X		Water temperature out of range	Bring water temp within design parameters
	X	X	Bad thermistor	Check temp and impedance correlation per chart
LT2 Fault - Code 5 Low Air Temperature		X	Reduced or no air flow in cooling	Check for dirty air filter and clean or replace
				Check fan motor operation and airflow restrictions
				Too high of external static - check static vs blower table
		X	Air temperature out of range	Too much cold vent air. Bring entering air temp within design parameters that IOM specifies.
		X	Improper low temperature setting (30°F vs 10°F)	Normal airside applications will require. Only setting for packaged units is 30°.
	X	X	Bad thermistor	Check temp and impedance correlation per chart
Condensate Fault - Code 6 High Condensate Level	X	X	Blocked drain	Check for blockage and clean drain
	X	X	Improper trap	Check trap dimensions and location ahead of vent
		X	Poor drainage	Check for piping slope away from unit
				Check slope of unit toward outlet
				Poor venting - check vent location
		X	Moisture on sensor	Check for moisture shorting to air coil
	X	X	Plugged air filter	Replace air filter
	X	X	Restricted return air flow	Find and eliminate rectriction - increase return duct and/or grille size. Check static pressure. See the diagram on B-D.

Functional Troubleshooting

A-F

Fault	Htg	Clg	Possible Cause	Solution
Over/Under Voltage - Code 7 (Auto Resetting)	X	X	Under voltage	Check power supply and 24VAC voltage before and during operation
				Check power supply wire size
				Check compressor starting. Need hard start kit?
				Check 24VAC and unit transformer tap for correct power supply voltage. See A-W.
	X	X	Over voltage	Check power supply voltage and 24VAC before and during operation.
				Check 24VAC and unit transformer tap for correct power supply voltage
Unit Performance Sentinel-Code 8	X		Heating Mode LT2>125°F	Check for poor air flow or overcharged unit
		X	Cooling Mode LT1>125°F OR LT2< 40°F	Check for poor water flow, or air flow
Swapped Thermistor Code 9	X	X	LT1 and LT2 swapped	Reverse position of thermistors
ECM Fault - Code 10	X	X	Blower does not operate	Check blower line voltage. See B-I.
				Check blower low voltage wiring
			Blower operating with incorrect airflow	Wrong unit size selection
				Wrong unit family selection
				Wrong motor size
				Incorrect blower selection
Low Air Coil Pressure Fault (ClimaDry) Code 11		X	Reduced or no air flow in cooling or ClimaDry	Check for dirty air filter and clean or replace
				Check fan motor operation and airflow restrictions
				Too high of external static - check static vs blower table
			Air temperature out of range	Too much cold vent air - bring entering air temp within design parameters
			Bad pressure switch	Check switch continuity and operation - replace
Low Air Coil Temperature Fault - (ClimaDry) Code 12		X	Reduced airflow in cooling, ClimaDry, or constant fan	Check for dirty air filter and clean or replace
				Check fan motor operation and airflow restrictions
				Too high of external static - check static vs blower table
			Air temperature out of range	Too much cold vent air - bring entering air temp within design parameters
			Bad thermistor	Check temp and impedance correlation per chart

A-F

Functional Troubleshooting

Fault	Htg	Clg	Possible Cause	Solution
IFC Fault Code 13 Internal Flow Controller Fault	X	X	No pump output signal	Check DC voltage between A02 and GND - should be between 0.5 and 10 VDC with pump active. See A-J.
			Low pump voltage	Check line voltage to the pump. See picture A-O.
			No pump feedback signal	Check DC voltage between T1 and GND. Voltage should be between 3 and 4 VDC with pump OFF, and between 0 and 2 VDC with the pump ON. See A-B.
			Bad pump RPM sensor	Replace pump if the line voltage and control signals are present at the pump, and the pump does not operate
Commercial Only **ESD - ERV Fault (DXM Only) Green Status LED Code 3**	X	X	ERV unit has fault (Rooftop units only)	Troubleshoot ERV unit fault
No Fault Code Shown	X	X	No compressor operation	See 'Only Fan Operates'
	X	X	Compressor overload	Check and replace if necessary
	X	X	Control board	Reset power and check operation
Unit Short Cycles	X	X	Dirty air filter	Check and clean air filte r
	X	X	Unit in 'Test Mode'	Reset power or wait 20 minutes for auto exit
Check Thermostat Location and Anticipation Setting	X	X	Unit selection	Unit may be oversized for space - check sizing for actual load of space
	X	X	Compressor overload	Check and replace if necessary
Only Fan Runs	X	X	Thermostat position	Insure thermostat set for heating or cooling operation
	X	X	Unit locked out	Check for lockout codes - reset power
	X	X	Compressor overload	Check compressor overload - replace if necessary
	X	X	Thermostat wiring	Check thermostat wiring at DXM2 - put in Test Mode and jumper Y1 and R to give call for compressor

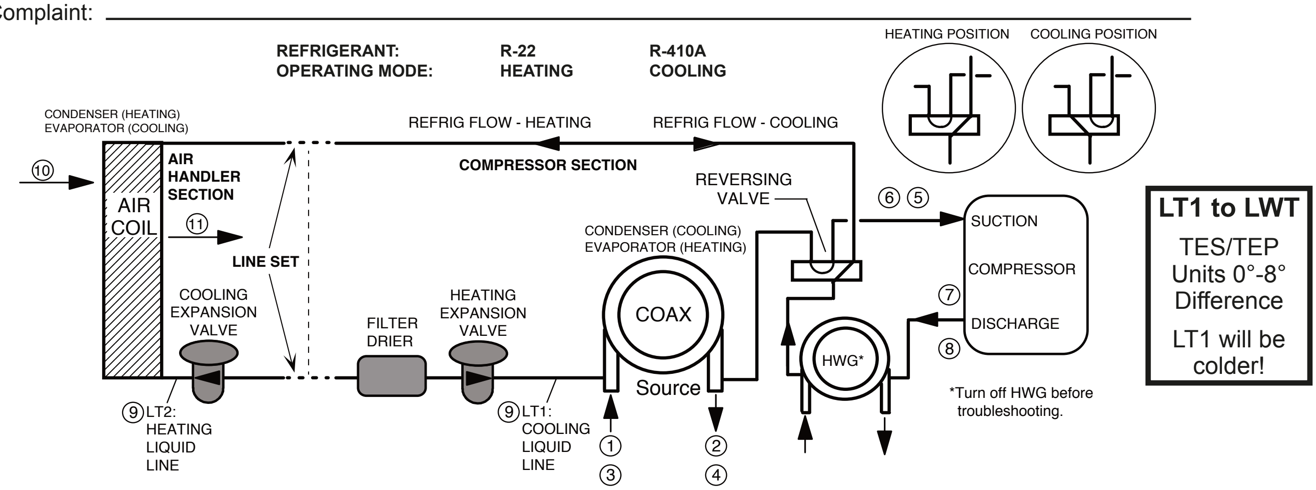
Typical Split Water-to-Air Troubleshooting Form

A-G

Customer: ______________________ Loop Type: ______________ Startup Date: ____________

Model #: ______________ Serial #: __________________ Antifreeze Type & %: ____________

Complaint: ____



Description		Heating	Cooling	Notes
Water Side Analysis				
1	Water In Temp.			
2	Water Out Temp.			Temp. Diff. =
3	Water In Pressure			
4	Water Out Pressure			
4a	Pressure Drop			
4b	GPM			

Heat of Extraction (Absorption) or Heat of Rejection:

HE or HR (Btuh) = ______________ **Enter HE or HR:** __________

Fluid Factor: 500 (Water); 485 (Antifreeze)

__________ **Flow Rate (GPM) x** __________ **Temp. Diff (deg F) x** __________ **Fluid Factor**

Description		Heating	Cooling	Notes
Refrigerant Analysis				
5	Suction Temp.			
6	Suction Pressure			
6a	Saturation Temp.			
6b	Superheat			
7	Discharge Temp.			
8	Discharge Pressure			
8a	Saturation Temp.			
8b	Subcooling			
9	Liquid Line Temp			
10	Return Air Temp.			
11	Supply Air Temp.			Temp. Diff. =
	Voltage			
	Compress Amps			

Line Set

Length: _____ Ft.

Liquid: _____ In. Dia

Suction: _____ In. Dia

A-G

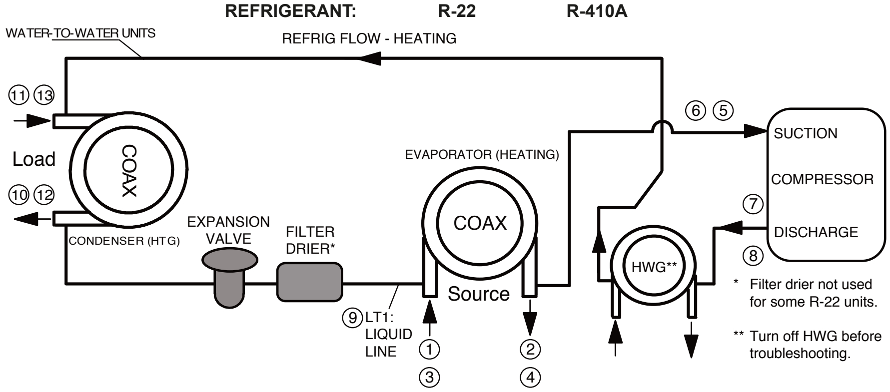
Typical Water Source Refrigeration Circuit (Heating Cycle)

Customer: ______________________ Loop Type: ______________________ Startup Date: ______________________

Model #: ______________________ Serial #: ______________________ Antifreeze Type & %: ______________________

Complaint: ____

REFRIGERANT: R-22 R-410A



LT1 to LWT in Heating

TZ Units 5°-10° Difference
TE Units 0°-8° Difference

LT1 will be colder!

Description		Heating	Notes
Water Side Analysis			
1	Water In Temp.		
2	Water Out Temp.		Temp. Diff. =
3	Water In Pressure		
4	Water Out Pressure		
4a	Pressure Drop		
4b	GPM		
Heat of Extraction (Absorption) or Heat of Rejection:			**Fluid Factor: 500 (Water); 485 (Antifreeze)**
HE or HR (Btuh) =		______ **Enter HE or HR:** ______	
______ **Flow Rate (GPM) x**		______ **Temp. Diff (deg F) x**	______ **Fluid Factor**
Refrigerant Analysis			
5	Suction Temp.		
6	Suction Pressure		
6a	Saturation Temp.		
6b	Superheat		
7	Discharge Temp.		
8	Discharge Pressure		
8a	Saturation Temp.		
8b	Subcooling		
9	Liquid Line Temp		
10	Load Water In Temp.		
11	Load Water Out Temp.		Temp. Diff. =
12	Load Water In Pressure		
13	Load Water Out Pressure		
13a	Pressure Drop		
13b	GPM		
	Voltage		
	Compress Amps		

Unit Operating Conditions

A-G

TE Coax Water Pressure Drop

Model	GPM	Pressure Drop (psi)			
		30°F	50°F	70°F	90°F
026	4.0	1.5	1.3	1.1	1.0
	6.0	3.1	2.6	2.3	2.1
	7.0	4.1	3.4	3.0	2.7
	8.0	5.1	4.3	3.8	3.4
038	4.0	1.2	1.0	0.8	0.6
	6.0	2.6	2.5	2.3	2.1
	8.0	4.5	4.2	4.0	3.7
	9.0	5.7	5.2	4.8	4.4
049	5.5	1.1	0.9	0.8	0.7
	8.3	2.2	2.1	2.0	1.8
	11.0	3.9	3.6	3.2	3.1
	12.0	4.5	4.2	3.8	3.5
064	7.0	0.5	0.3	0.2	0.1
	10.5	1.9	1.8	1.7	1.6
	14.0	3.9	3.5	3.2	2.9
	15.0	4.8	4.3	3.9	3.5
072	7.5	1.7	1.5	1.3	1.3
	11.3	3.9	3.4	3.0	2.8
	15.0	6.9	6.0	5.4	5.0
	17.0	8.9	7.7	6.9	6.5

TES/TEP Coax Water Pressure Drop

Model	GPM	Pressure Drop (psi)			
		30°F	50°F	70°F	90°F
026	2.3	0.7	0.4	0.4	0.5
	3.0	1.1	0.7	0.6	0.7
	3.4	1.3	0.9	0.8	0.8
	4.5	2.0	1.4	1.2	1.2
	6.0	3.1	2.3	1.9	1.8
038	3.0	1.5	0.9	0.8	0.9
	4.5	2.6	1.7	1.5	1.5
	6.0	3.8	2.7	2.3	2.2
	6.8	4.5	3.2	2.7	2.6
	9.0	6.9	5.2	4.4	4.1
049	4.5	0.8	0.6	0.5	0.3
	6.0	1.3	1.1	1.0	0.9
	6.8	1.6	1.4	1.3	1.2
	9.0	2.7	2.5	2.3	2.2
	12.0	4.6	4.2	3.8	3.5
064	6.0	0.9	0.2	0.2	0.3
	7.5	1.7	0.9	0.7	0.8
	9.0	2.5	1.5	1.3	1.4
	11.3	3.7	2.6	2.3	2.3
	12.0	4.1	3.0	2.6	2.6
	15.0	6.1	4.7	4.1	4.0

TZ Coax Water Pressure Drop

Model	GPM	Pressure Drop (psi)			
		30°F*	50°F	70°F	90°F
024 Rev B	2.5	0.8	0.3	0.2	0.2
	3.0	1.2	0.6	0.5	0.5
	3.8	1.8	1.1	0.9	0.8
	4.5	2.7	1.6	1.2	1.2
	6.0	3.9	2.8	2.2	2.0
030	3.0	1.7	0.9	0.8	0.8
	3.8	2.3	1.2	1.1	1.1
	4.5	2.7	1.6	1.4	1.4
	6.0	3.8	2.4	2.2	2.1
	7.5	5.1	3.5	3.1	2.9
036 Rev B	4.0	0.6	0.1	0.1	0.1
	6.0	1.8	1.0	0.7	0.7
	6.8	2.3	1.5	1.1	1.1
	8.0	3.2	2.2	1.8	1.7
	9.0	4.0	2.9	2.4	2.3
042	3.8	1.7	1.0	0.9	0.9
	5.3	2.7	1.8	1.6	1.5
	7.5	4.5	3.1	2.8	2.6
	7.9	4.8	3.4	3.1	2.9
	10.5	7.4	5.4	4.9	4.7
048	4.5	1.4	1.1	0.9	0.8
	6.0	2.0	1.7	1.4	1.3
	6.8	2.5	2.1	1.8	1.7
	9.0	4.0	3.4	3.0	2.7
	12.0	6.5	5.5	4.9	4.5
060 Rev B	6.0	1.2	0.9	0.8	0.8
	7.5	2.1	1.7	1.5	1.4
	9.0	3.1	2.5	2.3	2.2
	12.0	5.4	4.6	4.2	3.9
	15.0	8.1	7.0	6.4	6.1

* Based on 15% methanol antifreeze solution

A-H

Basic Refrigeration Summary

Expansion Valve System

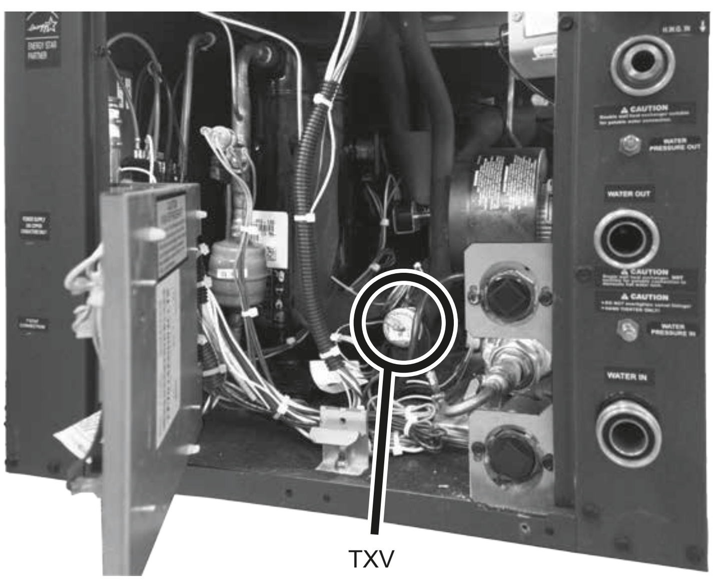
- Feeds refrigerant based upon the measured superheat at the compressor suction. It will appropriately "meter" to maintain superheat setting.
- Able to handle a wide range of capacities (inlet water temperatures)
- Bullet proof - You can't flood a compressor by overcharging with an expansion valve in the system and thus run the risk of compressor failure.
- Stores excess refrigerant in condenser

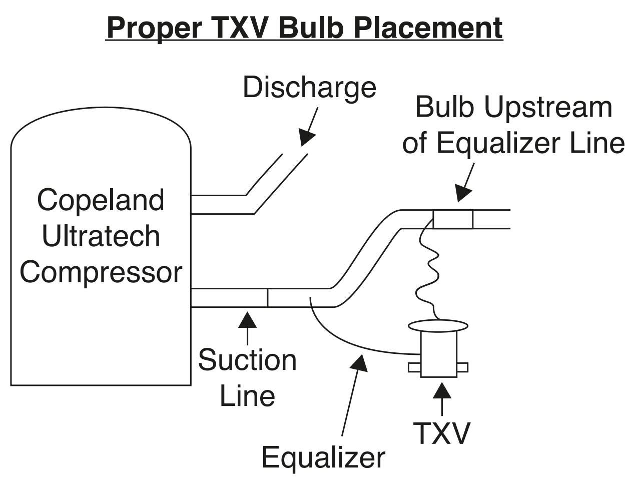
Overcharged System
- High subcooling
- Superheat will be maintained by expansion valve at valve setting
- Basically no change in capacity
- High discharge pressure

Undercharged System
- Low subcooling
- High superheat
- Lower capacity

TXV Stuck Closed (or Restriction)
- High superheat
- High subcooling
- Low suction
- High discharge pressure

TXV Stuck Open
- Low superheat
- Low subcooling
- High suction pressure





Refrigeration Troubleshooting

A-H

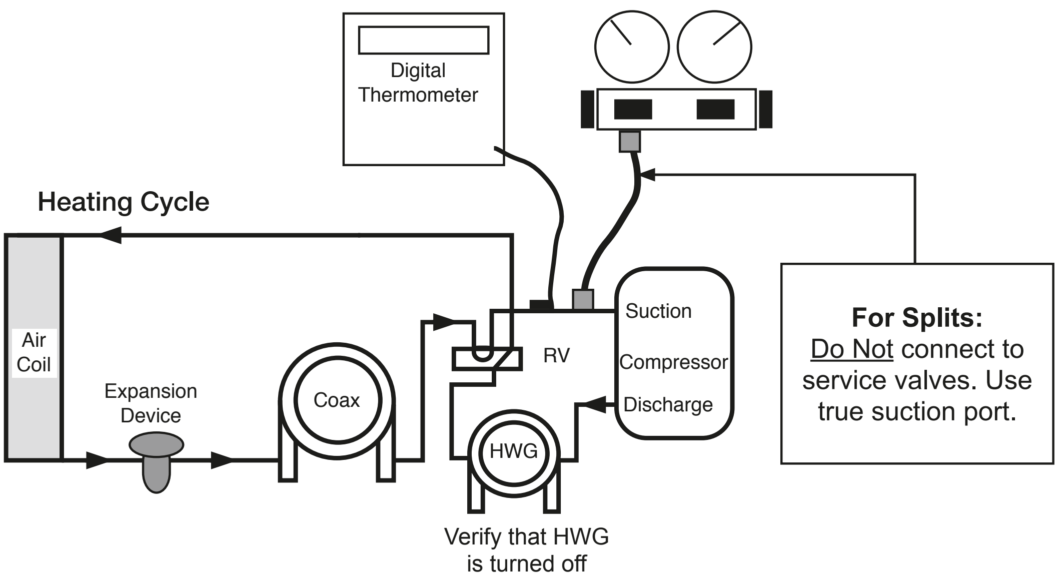
Measuring Superheat and Subcooling
Superheat and subcooling are a good indication of refrigeration efficiency. <u>However, water and air measurements should always be checked first.</u> Reference Figure 1a & 1b.

To Check SuperHeat and SubCooling
Determining Superheat:
1. Measure the temperature of the suction line at a point near the expansion valve bulb.
2. Determine the suction pressure in the suction line by attaching refrigeration gauges to the schrader connection on the side of the compressor.
3. Convert the pressure obtained in Step 2 above to the boiling point (sat temp) temperature by using the Press/Temp conversion table or the gauge set .
4. Subtract the temperature obtained in Step 3 from Step 1. The difference will be the superheat of the unit or the total number of degrees above the boiling point. Refer to the superheat Table 1 for superheat ranges at specific entering water conditions.

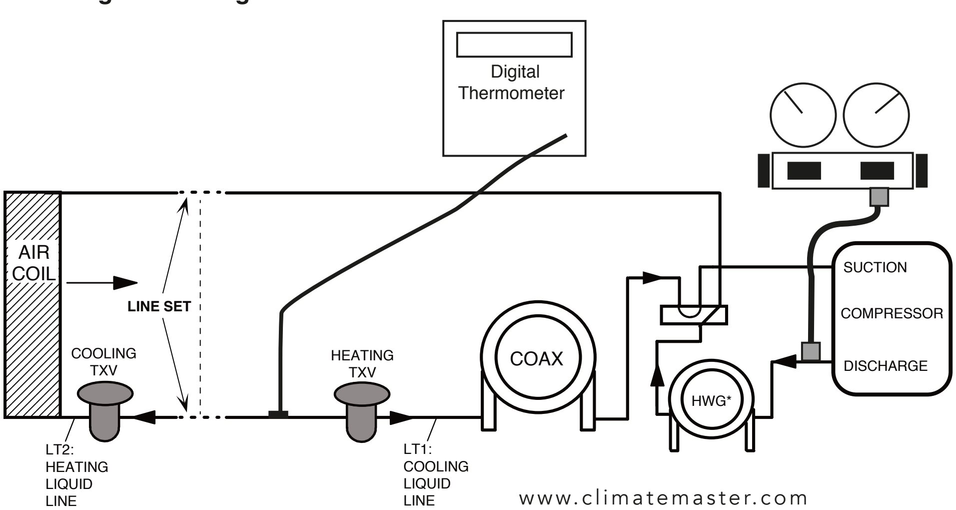
Example:
The temperature of the suction line at the sensing bulb is read at 59°F. The suction pressure at compressor is 135 psig which is the equivalent to 47°F saturation temperature from HFC-410A Press/Temp conversion table on the gauge set.

47°F subtracted from 59°F = 12°F Superheat

Measuring Superheat
Superheat = Suction Line Temperature - Suction Saturation Temperature



Measuring Subcooling



A-H Refrigeration Troubleshooting

Determining Sub-Cooling:

1. Measure the temperature of the liquid line. Note that the location of the liquid line changes, depending upon the mode (heating or cooling) for packaged units. For split units, measure liquid line temperature at the compressor section. Liquid line does not change on a split system.
2. Determine the condenser pressure (High Side) by attaching refrigerant gauges to the schrader connection on the hot gas discharge line of the compressor.
3. Convert the pressure obtained in step 2 above to the boiling point temperature by using the Press/Temp conversion table or the gauge set.
4. Subtract the temperature of Step 3 from the temperature of Step 1. The difference will be the sub-cooling value for that unit (total degrees below the boiling point). Refer to the sub-cooling Table 1 for values at specific entering water temperatures.

Example (HFC-410A):

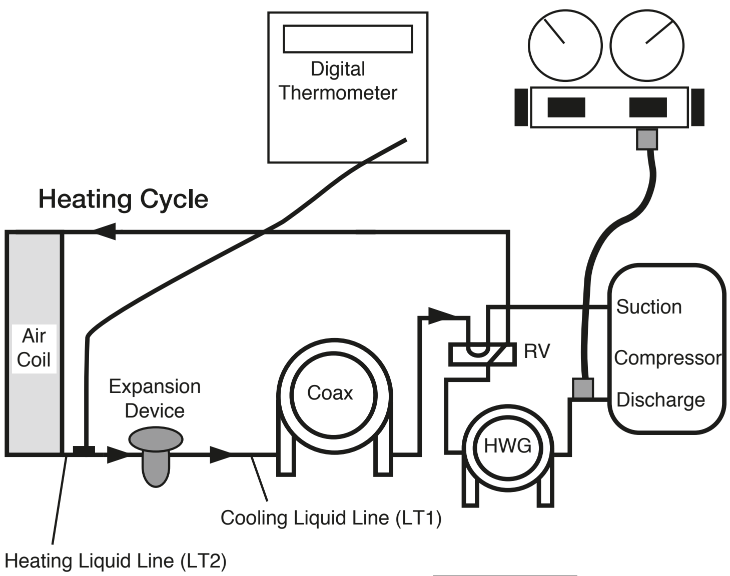
The condenser pressure at the high pressure service port is 340 psig, which is equivalent to 105°F. The liquid line (between the air coil and TXV in heating; between the coax and TXV in heating) measures 95°F.

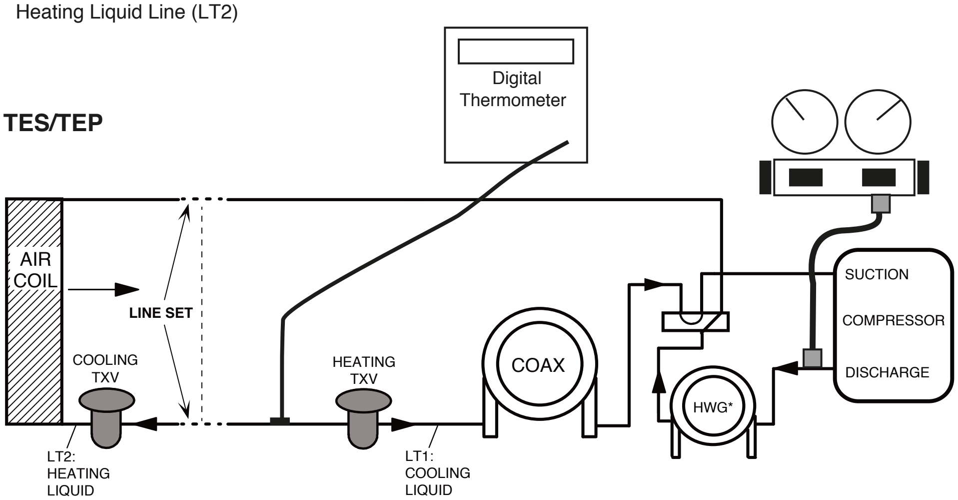
95°F subtracted from 105°F = 10°F sub-cooling

Consult the specific equipment information for refrigeration conditions. If a problem is suspected consult troubleshooting charts in unit IOM.

Measuring Subcooling

Subcooling = High Pressure Saturation Temperature - Liquid Line Temperature

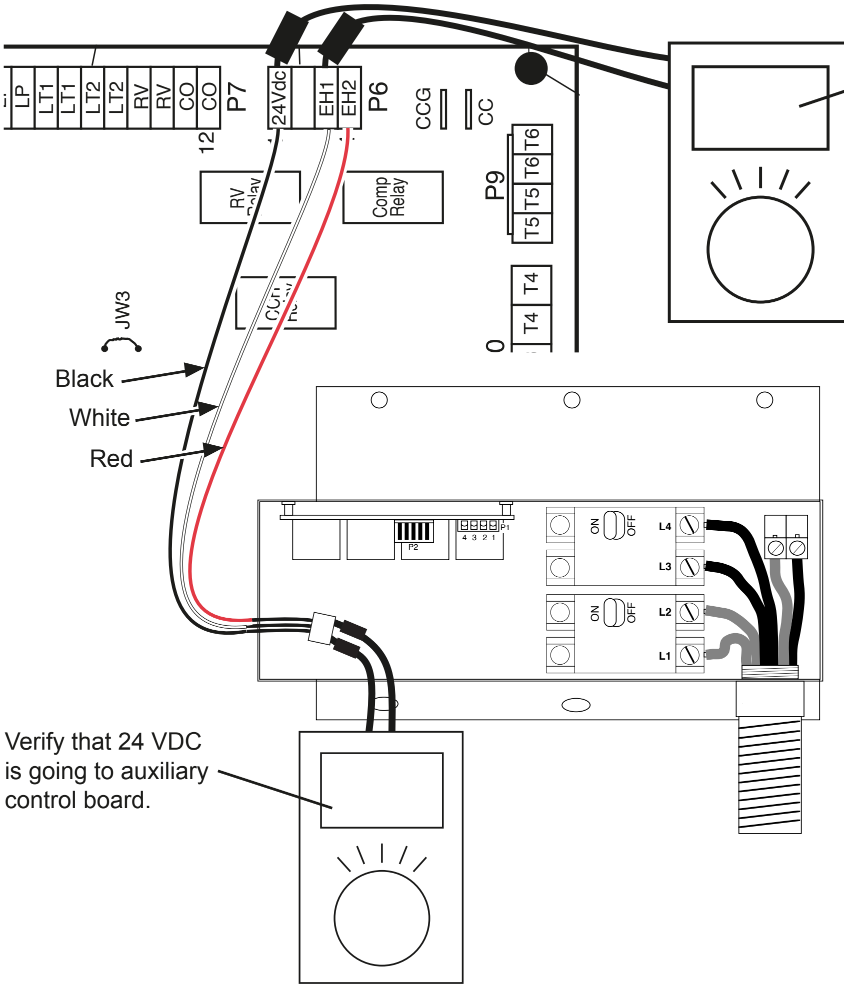




For Splits:
Do Not connect to service valves. Use true high pressure port.

Auxiliary Heat Check

A-I



24 volts DC
First stage auxiliary heat

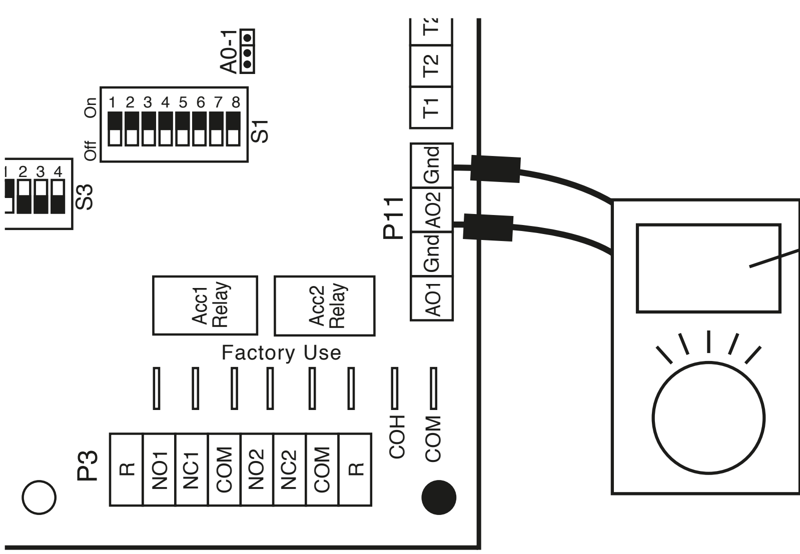
Note: Verify second stage auxiliary heat by moving one prod to EH2

Note: If dipswitch #6 in bank S1 is turned OFF, the relays will rapidly turn on and off and will burn up the relays.

Note: On Splits, check this on the AXM Board in the Air Handler.

Checking Pump Output

A-J

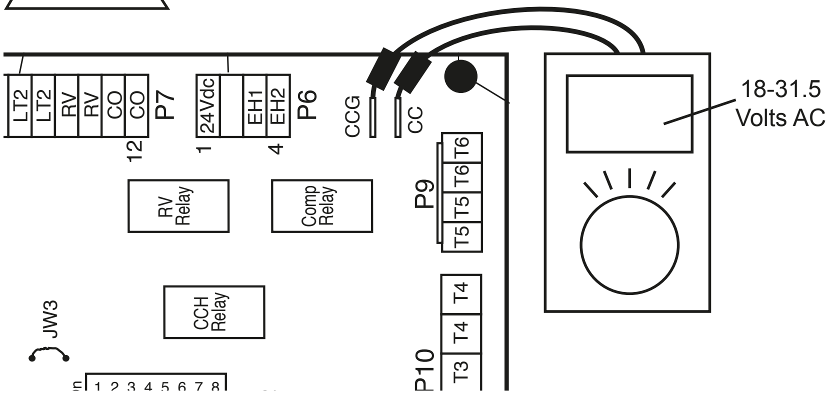


0.5-10 VDC with Pump Running

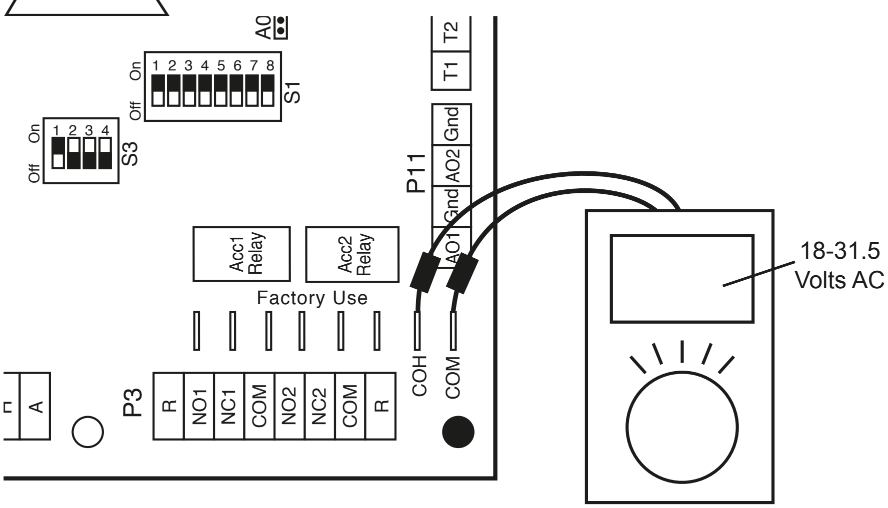
Note: P11 is the DXM2's output signal is to the pump.

Note: White wire is connected to A02.

A-K Compressor Contactor Voltage Check



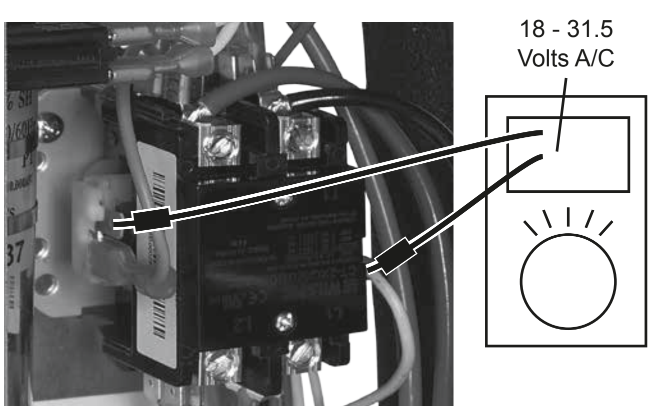
A-L Check CCH for 24 volts (Second Stage Operation)



A-M Verifying Contactor

Verify that 24 volts are going to the compressor contactor.

Also verify that contactor has between 7-20 ohms across the coil with the power removed.



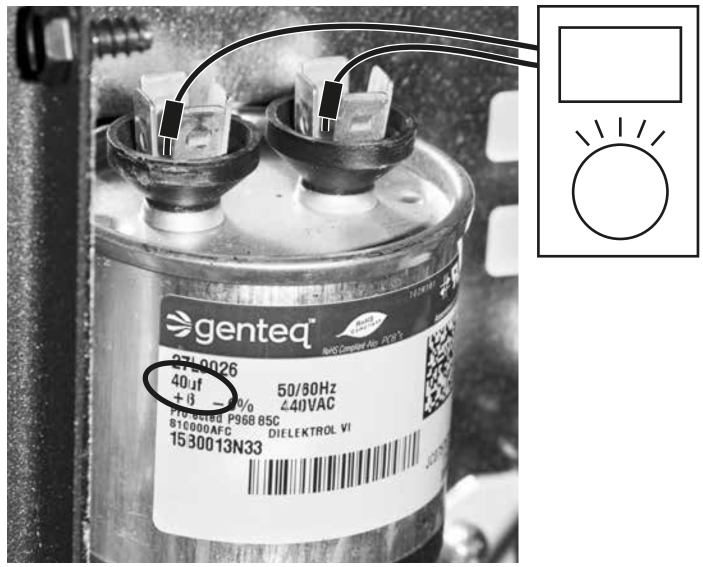
Verifying Capacitor

A-N

First, remove the power to the unit and allow 5-10 minutes for the capacitor to discharge.

After discharge, remove two wires from capacity. Read UF on side and verify with volt meter that can read UF. It will also show ± range for reading.

Note: Rating will change with different size units.



Checking Pump Power Cord

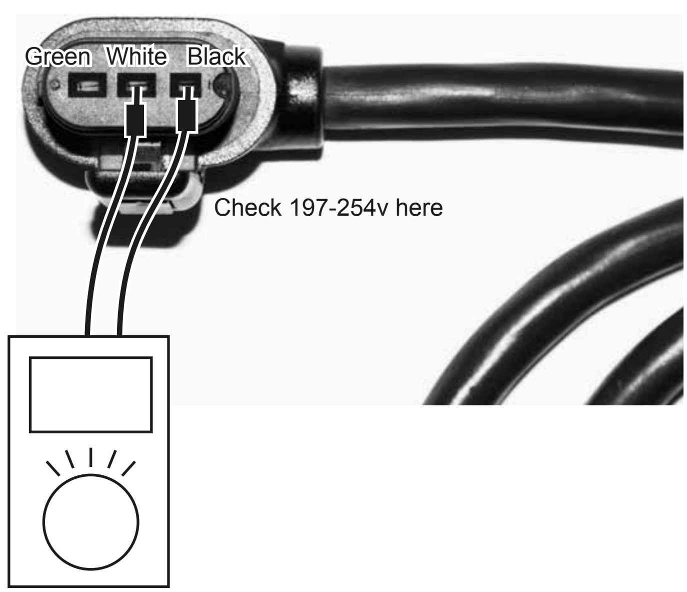
A-O

Verify 197-254V on pump power cord.

Note: Before removing cord from pump, verify that power is turned off on unit or pump will be damaged!

Note: Thermostat/service tool display may still show watts even if one leg of power to the pump (110V) is not functioning. This can result in LT1 faults in heating and high pressure faults in cooling.

Note: Do not force probes into plug. May need to use a piece of 18 guage wire into plug then check voltage.

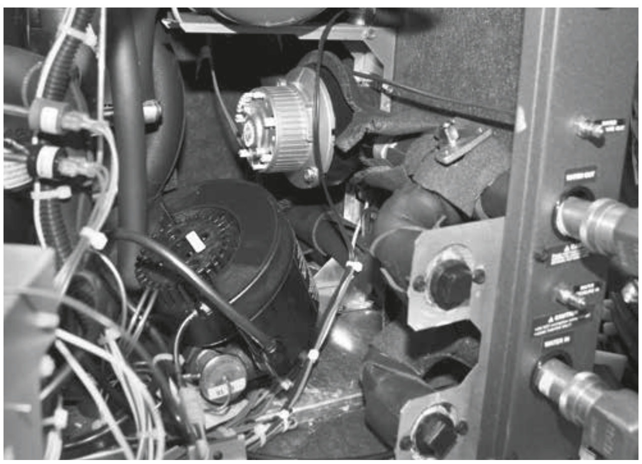


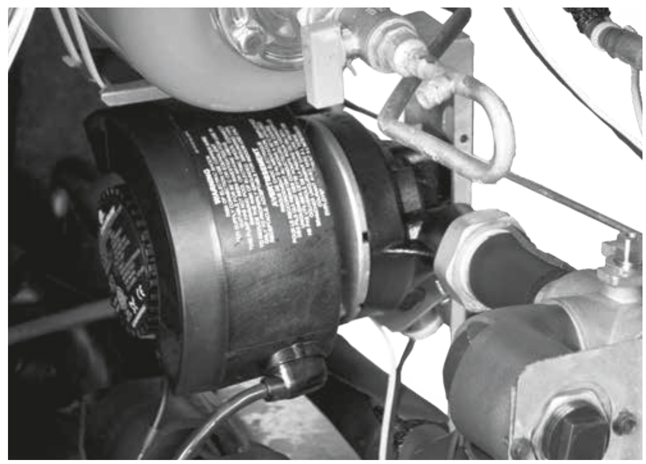
A-P

Replacing Variable-Speed Pump Power Head

1) You can remove power head from motor with # 25 Torx driver if feedback is out of range.

2) Remove plastic cover to remove Torx head screws.

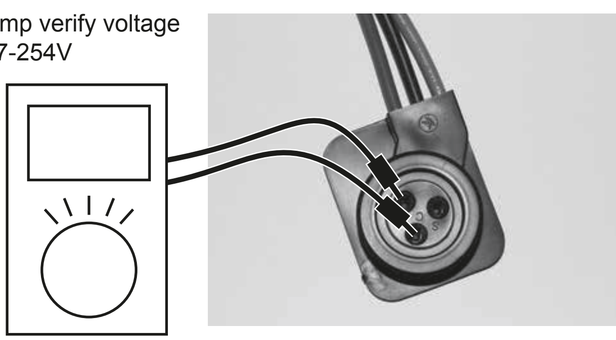




A-Q

Verifying Power at Molded Plug For Compressor

Comp verify voltage
197-254V



Verifying Antifreeze

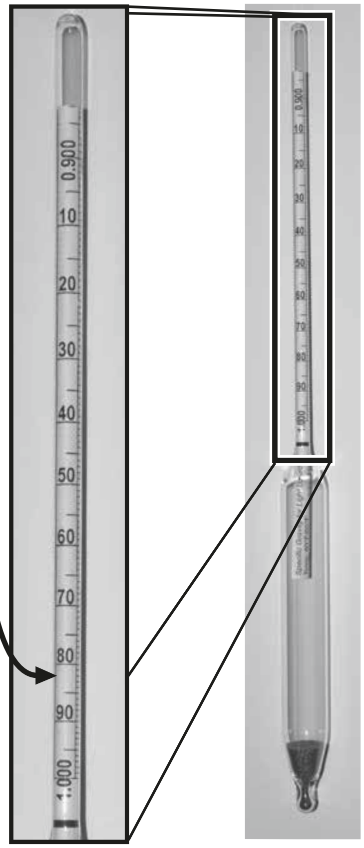
A-R

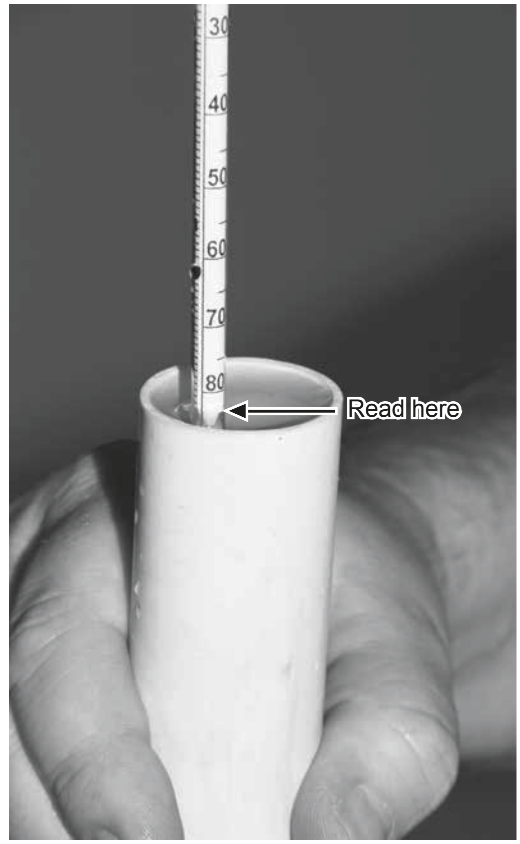
1) Place hydrometer in antifreeze.

2) Read hydrometer where water hits hydrometer.

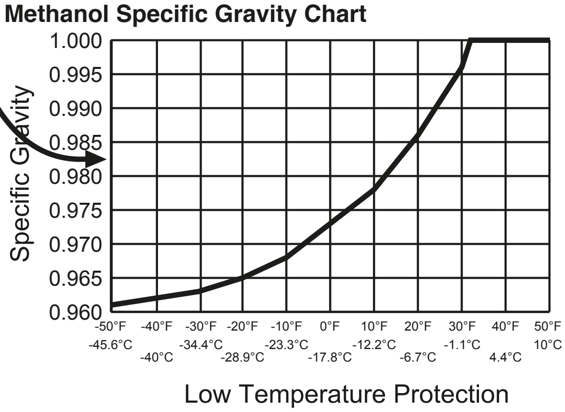
3) Compare hydrometer to the charts below.

Example: 15°F Methanol = .9825 specific gravity

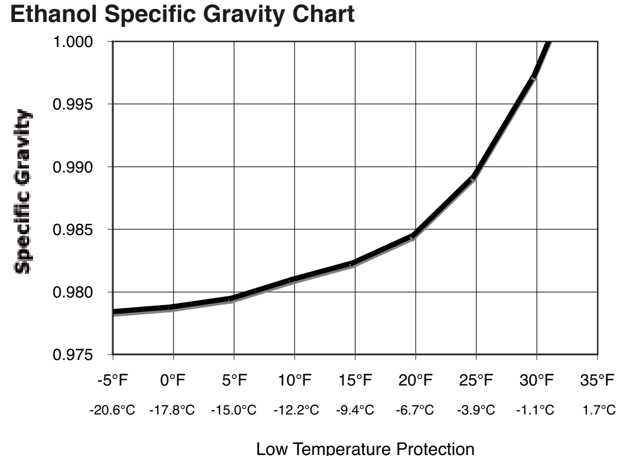




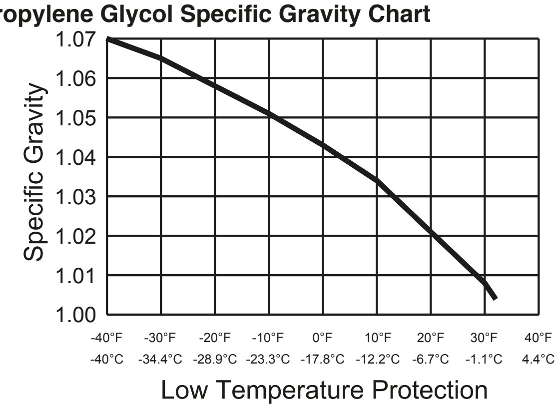
Methanol Specific Gravity Chart



Ethanol Specific Gravity Chart



Propylene Glycol Specific Gravity Chart



10° – 15° Protection
Typical Ready Ranges

Methanol	=	.975 - .982
Ethanol	=	.981 - .982
Propolyene Glycol	=	1.025 - 1.03

A-S

Second Stage Verification

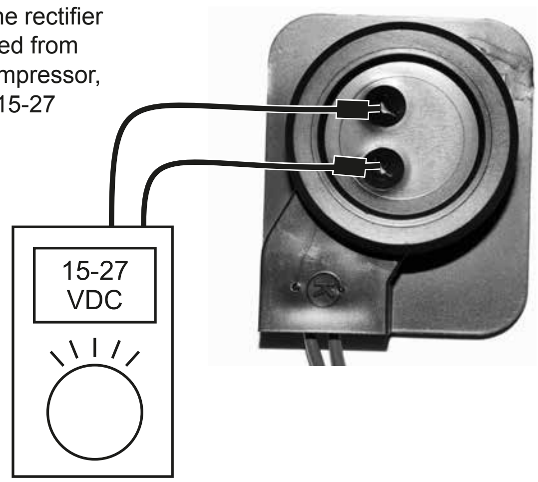
1) Remove rectifier.

2) When rectifier is removed, verify that pins are not bent.

3) Perform an amp draw and read the amps. Then remove rectifier. Amp draw should go down.

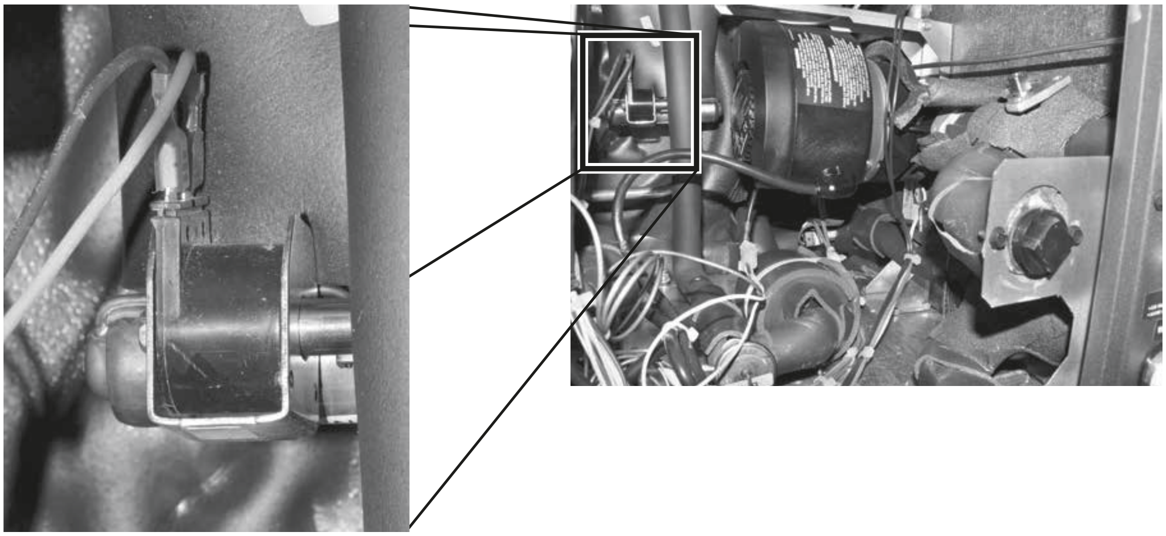
If there is no change in amps, then the compressor is not shifting.

4) With the rectifier removed from the compressor, verify 15-27 VDC.



Verifying 24V at Reversing Valve

A-T

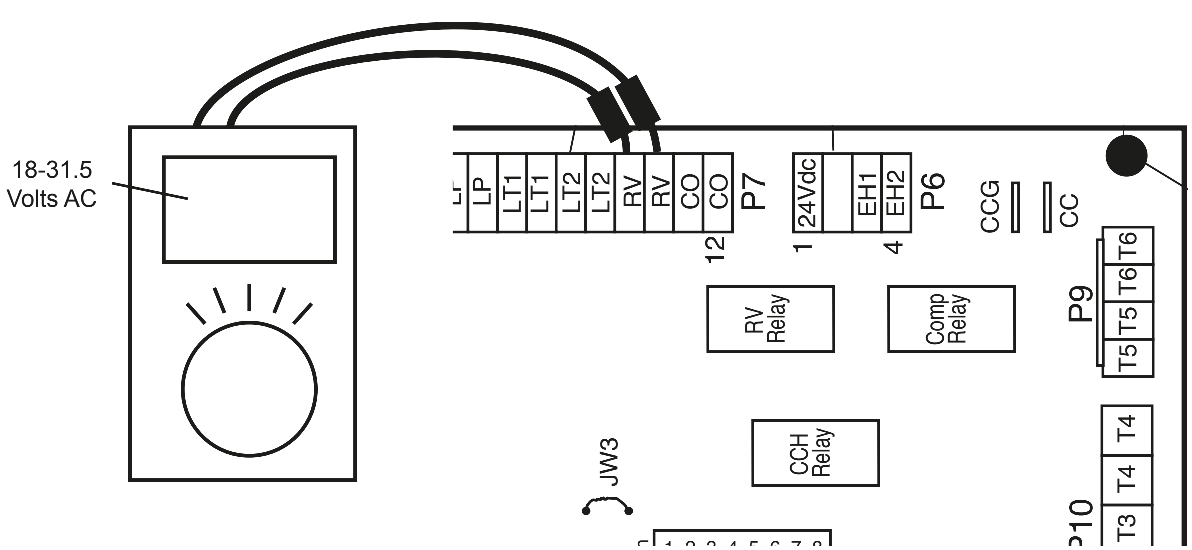


Verify 24V at reversing valve when calling for cooling

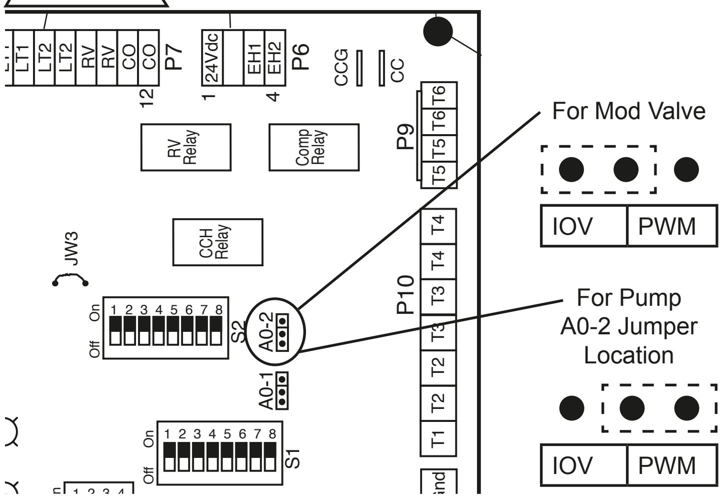
To check the solenoid's magnetic pull, begin by pulling solenoid off of reversing valve. Then energize solenoid and place a metal screw driver in solenoid. You should feel the screw driver being pulled by the magnetic field.

Checking Reversing Valve at DXM2

A-U

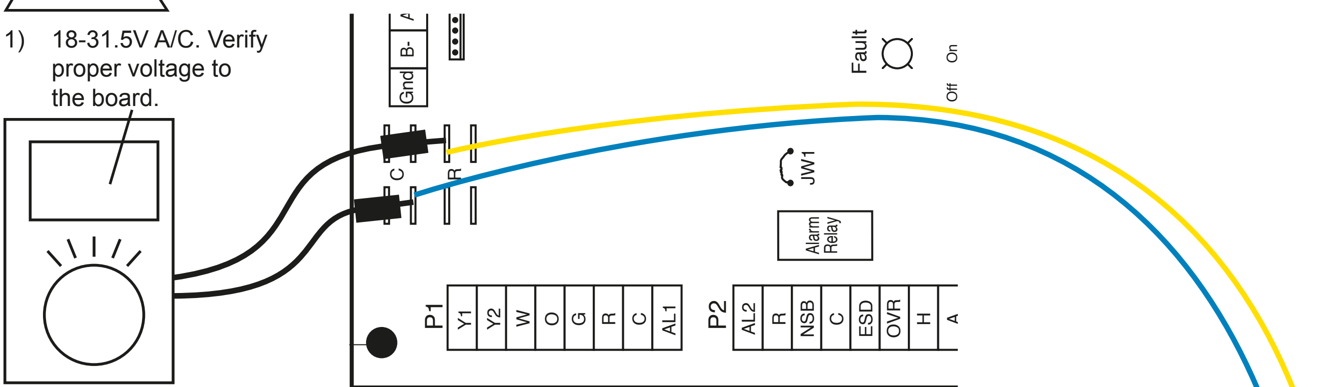


A-V A0-2 Jumper



A-W Checking for Power at DXM2

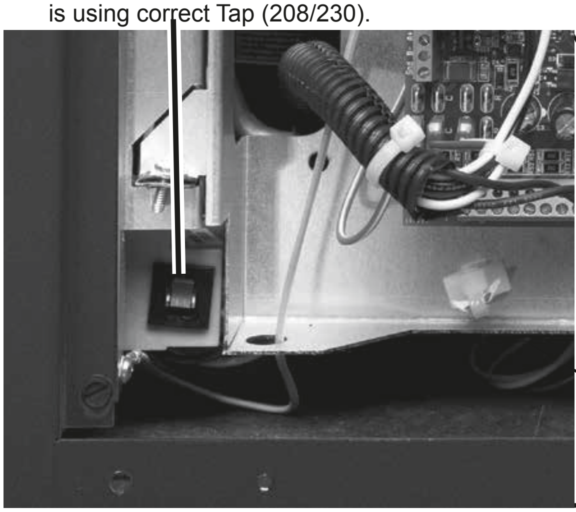
1) 18-31.5V A/C. Verify proper voltage to the board.

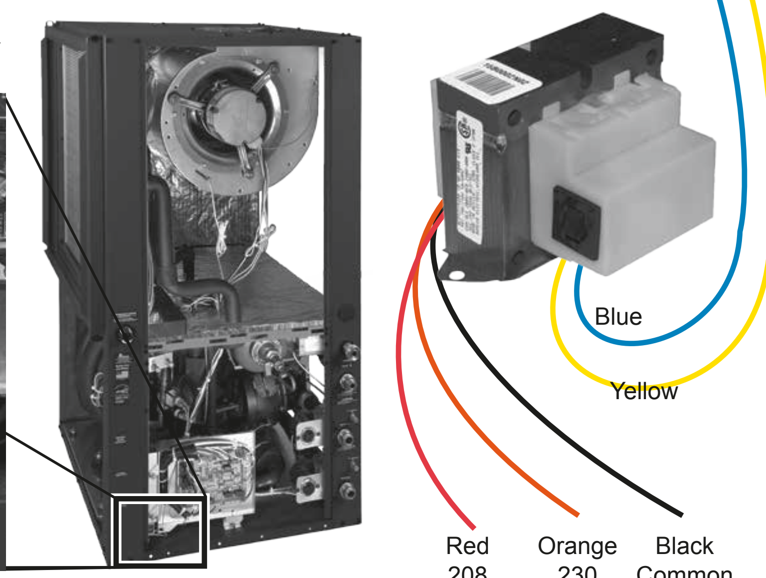


2) If there is no 24V at DXM2, verify that the breaker is not tripped on the transformer.

Ensure that the power supply to your transformer is using correct Tap (208/230).

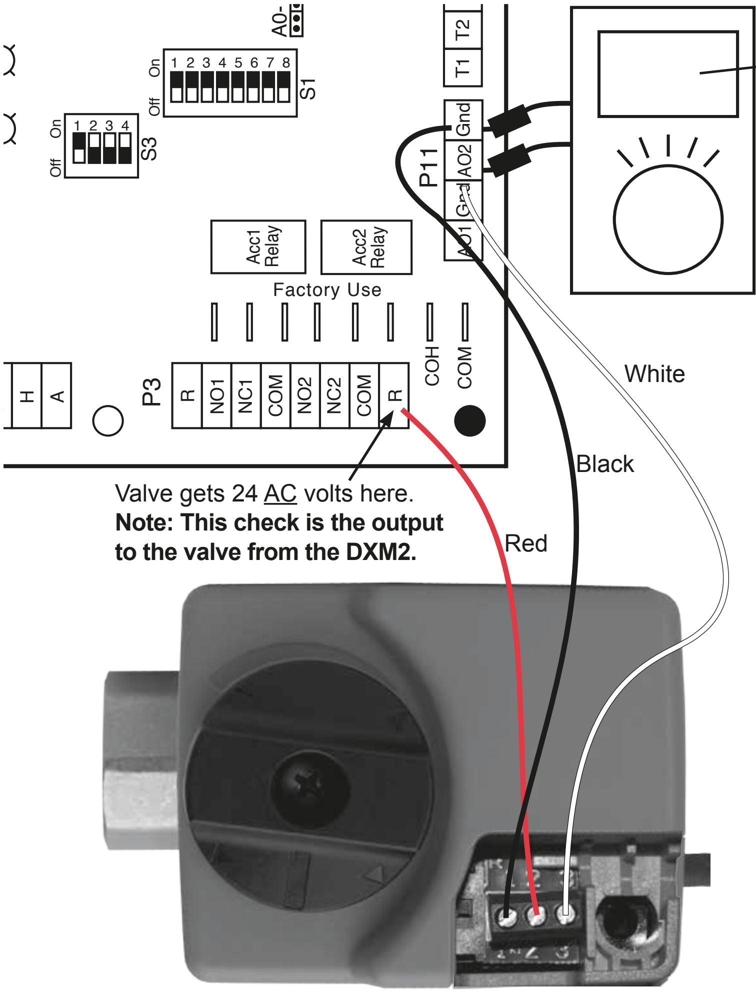
Note: On Splits, 24V transformer is in the Air Handler connected to the AXM board then connected to DXM2.





Verifying DC Voltage on DXM2 Board for Modulating Valve Check

A-X

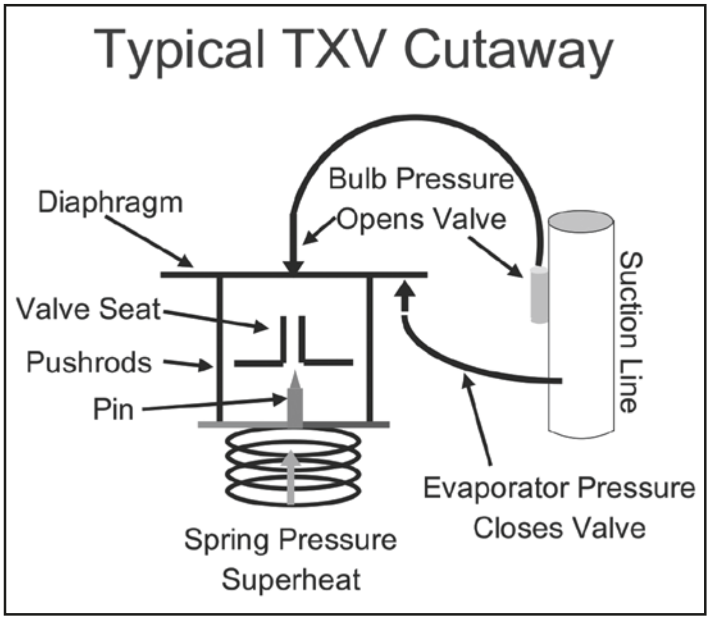


You should see 3.3-10 Volts A/C D/C when valve is functioning properly.

The voltage relates to the valve position:

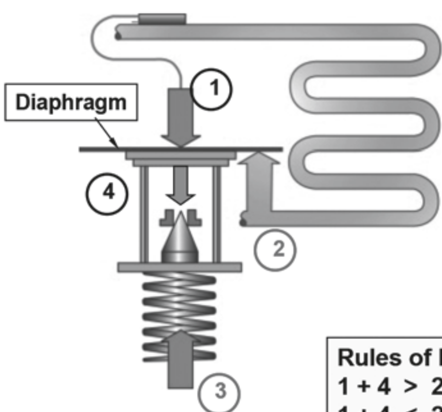
Valve 0% Open	=	3.30 VDC
Valve 50% Open	=	5.00 VDC
Valve 100% Open	=	10.00 VDC

A-Y TXV Bulb Test



Pressure Gauge

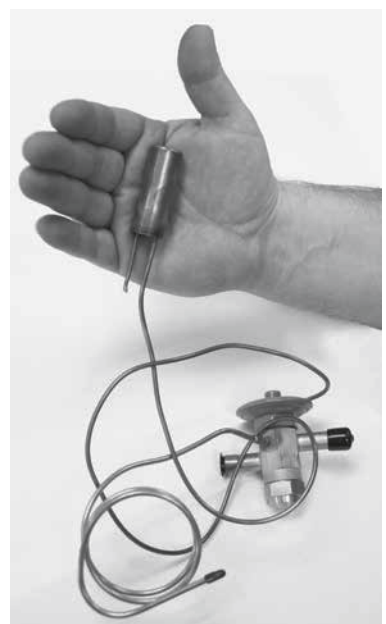
TXV Pressure Force Balance



Force Description:

1. **(opening force): Pressure exerted on top of diaphragm and created by the temperature of the bulb and refrigerant in the charge.**
2. **(closing force): Suction pressure exerted under diaphragm**
3. **(closing force): Factory preset superheat spring**
4. **(opening force): Liquid pressure acting on pin area. This force is eliminated in the balanced port construction.**

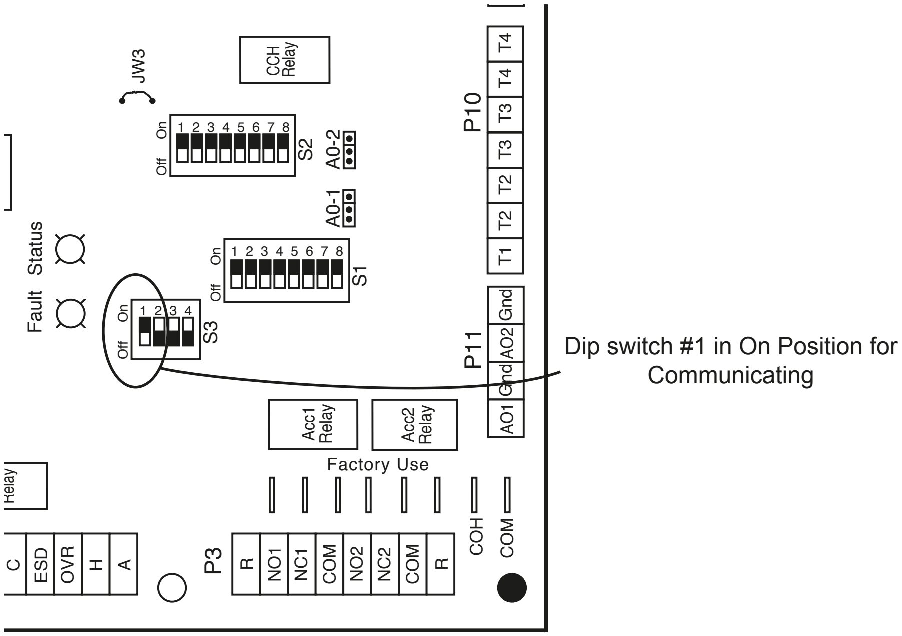
Rules of Movement	
1 + 4 > 2 + 3	**Valve will move open**
1 + 4 < 2 + 3	**Valve will move close**
1 + 4 = 2 + 3	**Valve will stay in position**



Suction pressure increases when warmed and decreases when bulb is cooled in cup of ice water

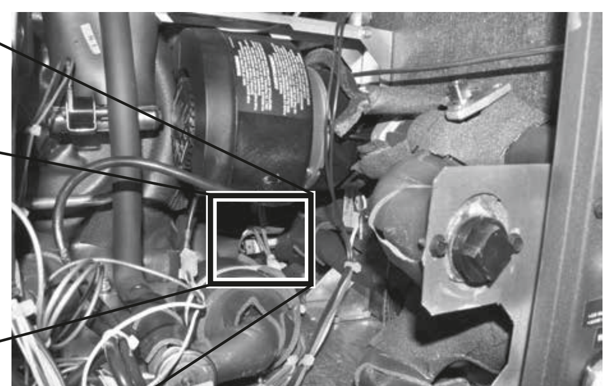
Verifying Dipswitch Position

A-Z



Replacing High Pressure Water Switch

B-A



Note: Switches are in series with high pressure refrigerant switch

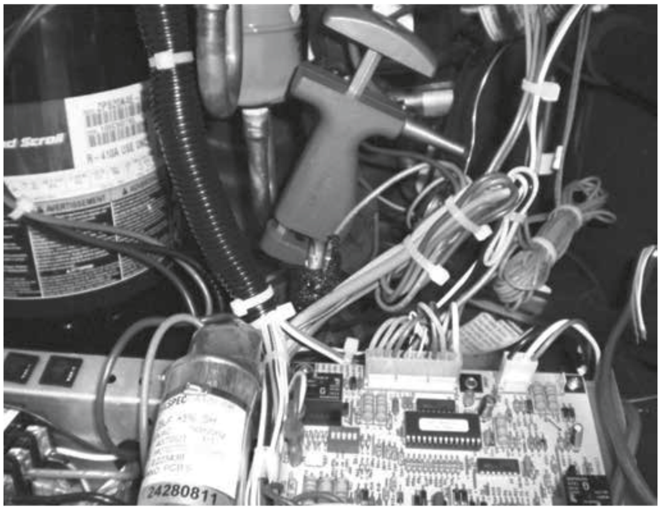
One of two high pressure water switches set to 145 PSI.

Note: If you are replacing a high pressure water switch, you can simply screw them off. However, beware that there is no Schrader core. To prevent water escaping when you remove the high pressure water switch, isolate the loop using flush valves in units with variable-speed pumps. To isolate the loop in units with modulating valves, use exterior ball valves.

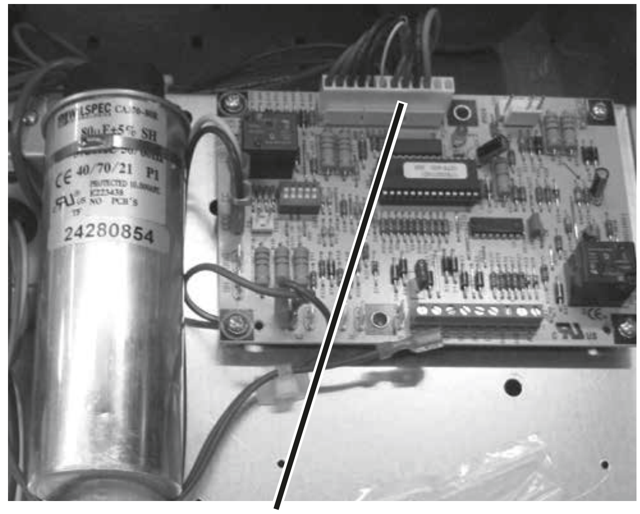
Note: After July 2014 high pressure water switches are only in units with modulating valves.

B-B

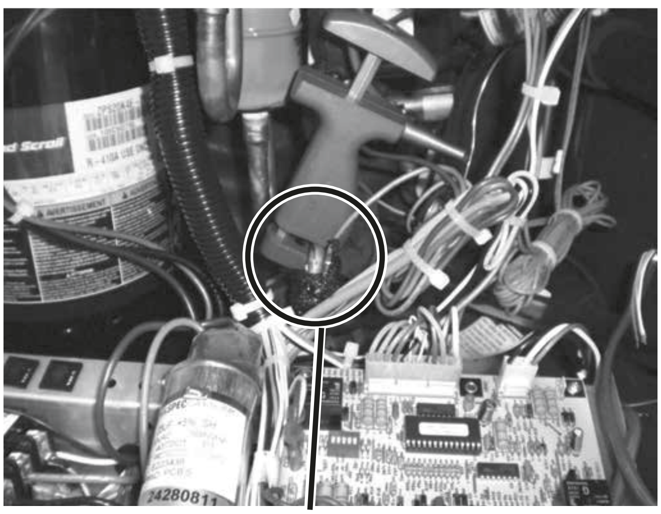
Verifying a Thermistor



1) Clamp on digital to read ref next to LT1 to verify sensor

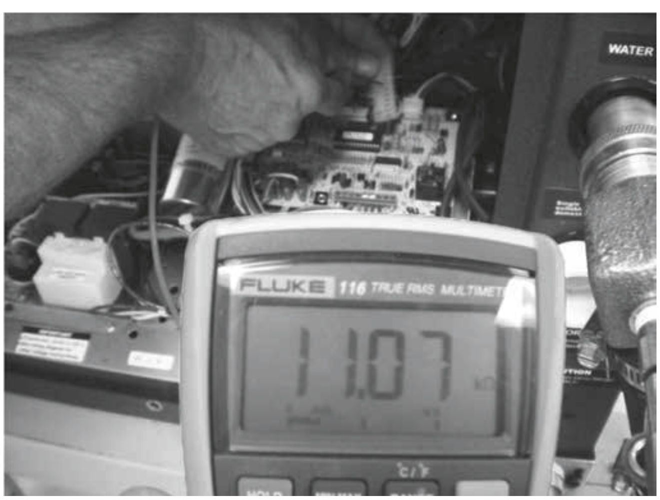


2) Remove this Molex plug to check resistance of the FP1/ LT1 sensor



3) Clamp on the meter close to the sensor location

4) Temperature reading



5) Resistance reading

Verifying a Thermistor

B-B

Thermistor Temperature Sensors – The thermistors used with the DXM2 are NTC (negative temperature coefficient) type. Table 7 shows the replacement part numbers for the LT1 and LT2 thermistors. The sensors have a 1% tolerance and follow the characteristics shown in '1% Sensor Calibration Points Table'. The 'Nominal resistance at various temperatures Table' shows the nominal resistance at any given temperature and can be used for field service reference. The sensor will use a minimum of 24 awg wire.

1% Sensor Calibration Points Table

Temp (°F)	Minimum Resistance (Ohm)	Maximum Resistance (Ohm)	Nominal Resistance (Ohm)
78.5	9523	9715	9619
77.5	9650	9843	9746
76.5	10035	10236	10135
75.5	10282	10489	10385
33.5	30975	31598	31285
32.5	31871	32512	32190
31.5	32653	33310	32980
30.5	33728	34406	34065
1.5	80624	82244	81430
0.5	83327	85002	84160
0.0	84564	86264	85410

Nominal resistance at various temperatures Table

Temp (ºC)	Temp (ºF)	Resistance (kOhm)	Temp (ºC)	Temp (ºF)	Resistance (kOhm)
-17.8	0.0	85.34	55	131.0	2.99
-17.5	0.5	84.00	56	132.8	2.88
-16.9	1.5	81.38	57	134.6	2.77
-12	10.4	61.70	58	136.4	2.67
-11	12.2	58.40	59	138.2	2.58
-10	14.0	55.30	60	140.0	2.49
-9	15.8	52.38	61	141.8	2.40
-8	17.6	49.64	62	143.6	2.32
-7	19.4	47.05	63	145.4	2.23
-6	21.2	44.61	64	147.2	2.16
-5	23.0	42.32	65	149.0	2.08
-4	24.8	40.15	66	150.8	2.01
-3	26.6	38.11	67	152.6	1.94
-2	28.4	36.18	68	154.4	1.88
-1	30.2	34.37	69	156.2	1.81
0	32.0	32.65	70	158.0	1.75
1	33.8	31.03	71	159.8	1.69
2	35.6	29.50	72	161.6	1.64
3	37.4	28.05	73	163.4	1.58
4	39.2	26.69	74	165.2	1.53
5	41.0	25.39	75	167.0	1.48
6	42.8	24.17	76	168.8	1.43
7	44.6	23.02	77	170.6	1.39
8	46.4	21.92	78	172.4	1.34
9	48.2	20.88	79	174.2	1.30
10	50.0	19.90	80	176.0	1.26
11	51.8	18.97	81	177.8	1.22
12	53.6	18.09	82	179.6	1.18
13	55.4	17.26	83	181.4	1.14
14	57.2	16.46	84	183.2	1.10
15	59.0	15.71	85	185.0	1.07
16	60.8	15.00	86	186.8	1.04
17	62.6	14.32	87	188.6	1.01
18	64.4	13.68	88	190.4	0.97
19	66.2	13.07	89	192.2	0.94
20	68.0	12.49	90	194.0	0.92
21	69.8	11.94	91	195.8	0.89
22	71.6	11.42	92	197.6	0.86
23	73.4	10.92	93	199.4	0.84
24	75.2	10.45	94	201.2	0.81
25	77.0	10.00	95	203.0	0.79
26	78.8	9.57	96	204.8	0.76
27	80.6	9.16	97	206.6	0.74
28	82.4	8.78	98	208.4	0.72
29	84.2	8.41	99	210.2	0.70
30	86.0	8.06	100	212.0	0.68
31	87.8	7.72	101	213.8	0.66
32	89.6	7.40	102	215.6	0.64
33	91.4	7.10	103	217.4	0.62
34	93.2	6.81	104	219.2	0.60
35	95.0	6.53	105	221.0	0.59
36	96.8	6.27	106	222.8	0.57
37	98.6	6.01	107	224.6	0.55
38	100.4	5.77	108	226.4	0.54
39	102.2	5.54	109	228.2	0.52
40	104.0	5.33	110	230.0	0.51
41	105.8	5.12	111	231.8	0.50
42	107.6	4.92	112	233.6	0.48
43	109.4	4.72	113	235.4	0.47
44	111.2	4.54	114	237.2	0.46
45	113.0	4.37	115	239.0	0.44
46	114.8	4.20	116	240.8	0.43
47	116.6	4.04	117	242.6	0.42
48	118.4	3.89	118	244.4	0.41
49	120.2	3.74	119	246.2	0.40
50	122.0	3.60	120	248.0	0.39
51	123.8	3.47	121	249.8	0.38
52	125.6	3.34	122	251.6	0.37
53	127.4	3.22	123	253.4	0.36
54	129.2	3.10			

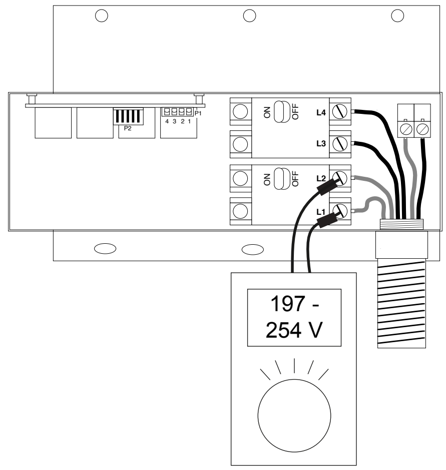
Example: See images 4 and 5 on previous page.

If your temperature reading is 71.2 with 11.07 ohms, your sensor is good.

All thermistors in Tranquility® units can use this chart for verification

B-C

Turning Breaker on in Panel or Auxiliary Heat Control



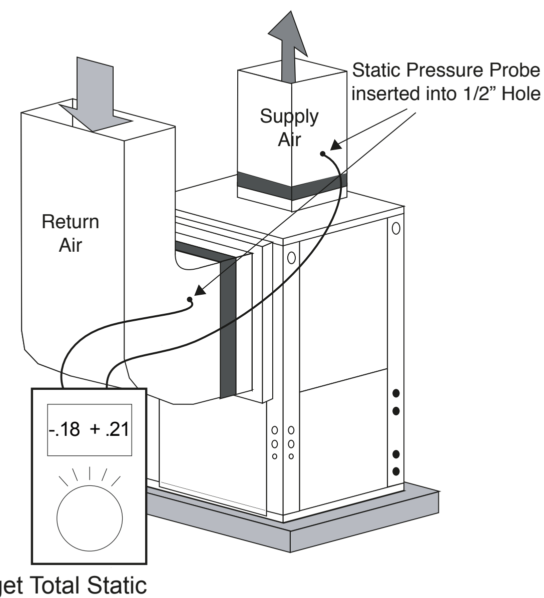
B-D

Static Pressure Check

With the blower at full load air speed, take a reading from the Digital Manameter. Check the reading against the IOM blower tables or in the tables shown below to determine the maximum external static pressure.

Verify that all grilles and registers are open and free.

Use a Magnetic Static Pressure Tip tool (far right) to check the static pressure.



Add both together to get Total Static
Example: .39 Static Pressure

Magnetic Static Pressure Tip

ECM Blower Performance Static Pressure Tables

Tranquility® 30 (TE) Series

Airflow in CFM with wet coil and clean air filter

Model	Max ESP (in. wg)
026	1.0
038	0.9
049	1.0
064	0.7
072	0.7

Airflow is controlled within 5% up to the Max ESP shown with wet coil.

Tranquility® 22 (TZ) Series

Airflow in CFM with wet coil and clean air filter

Model	Max ESP (in. wg)
024	0.75
030	0.5
036	0.6
042	0.6
048	0.75
060	0.75

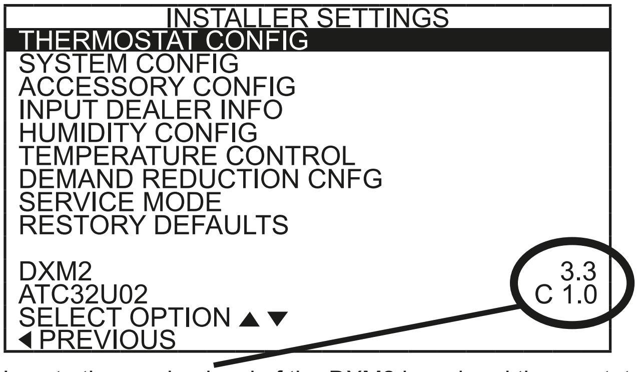
Airflow is controlled within 5% up to the Max ESP shown with wet coil.
Factory shipped on default CFM.

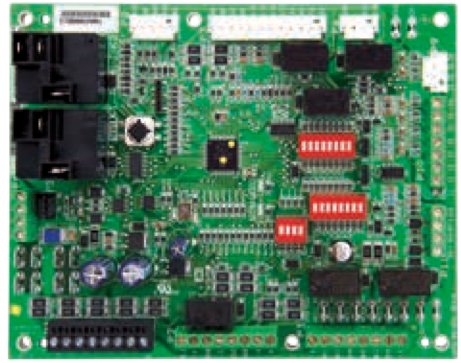
Tranquility® Digital Air Handler (TAH)

Model	Max ESP (in. wg)
026	1.0
038	0.9
049	1.0
064	0.7

Locating Thermostat Version and DXM2 Version

B-E





Locate the version level of the DXM2 board and thermostat or service tool on the screen. You can locate the part number on the board and compare it to the table below.

Note: In the future, if there are software changes, the part number will also change.

Program History of DXM2	
Part Number / Dots	**Version Number**
17B002N10	Version 3.6
	Version 3.3
17B0002N06	Version 1.2
17B0002N05	
17B0002N02 with 3 Yellow Dots	
2 Yellow Dots	
1 Yellow Dot	Version 1.1
3 Gray Dots	Version 1.0
2 Gray Dots	Version 0.3
1 Gray Dot	Shows up as nothing
No Dots	

Note: Any board version lower than 3.3 should be replaced if experiencing any odd symptoms or lockouts that are unexplained

UltraCheck - EZ™ Motor Diagnostic Tool

B-F

EZ TOOL			
Orange Power Button	**Green LED**	**Motor Blower**	**Comments**
Not Lit	Not Lit	Not Rotating	If button does not illuminate when power button is depressed, verify 24Vac is available at alligator clips. If 24Vac is verified, the UltraCheck-EZ diagnostic tool is inoperable.
Lit	Blinking	Rotating	Motor and control unit are functioning properly.
Lit	Not Lit	Rotating	Control unit should be replaced
Lit	Blinking	Not Rotating	Further investigation required. Proceed to check IV to verify motor operation.
Lit	Not Lit	Not Rotating	Control unit should be replaced, proceed to check IV to verify the motor is still operational.

B-G

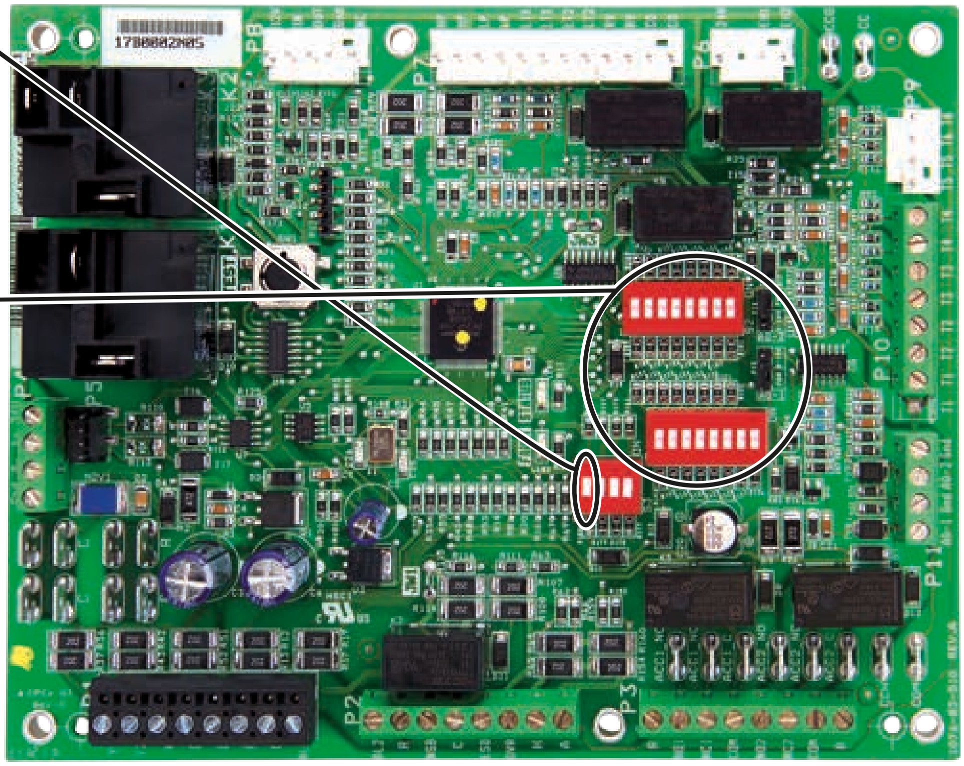
Checking Dipswitches on DXM2

Verify that dipswitch number 1 is in the 'On' position.

If dipswitch number 1 is in the 'Off' position, the thermostat will not function.

Under most residential situations, dipswitch banks 1 and 2 will all be in the 'On' position.

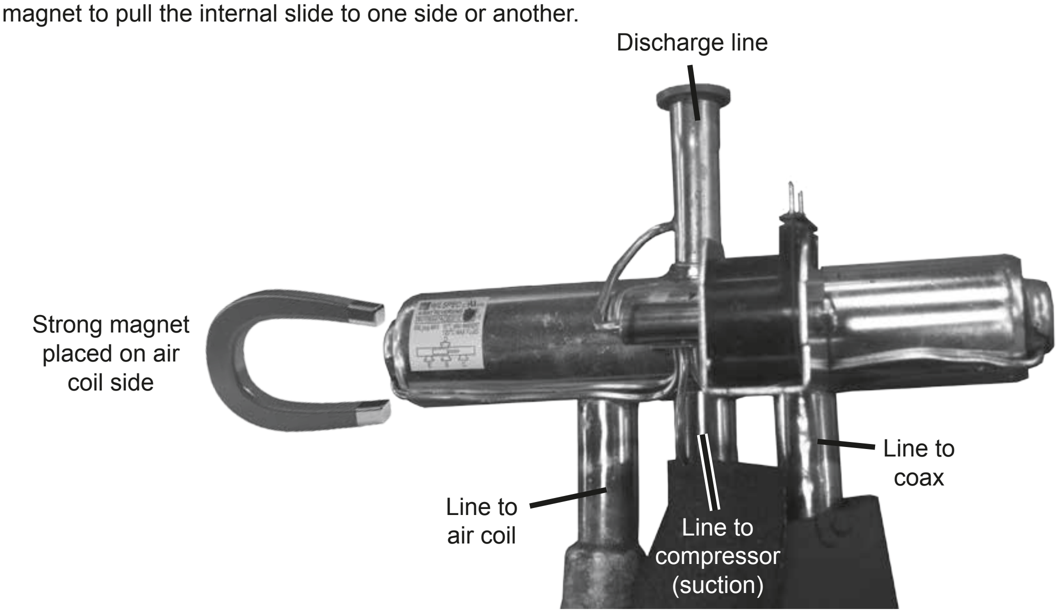
If any of these dipswitches need to be switched to 'Off', consult the DXM2 AOM (97B0003N15).



B-H

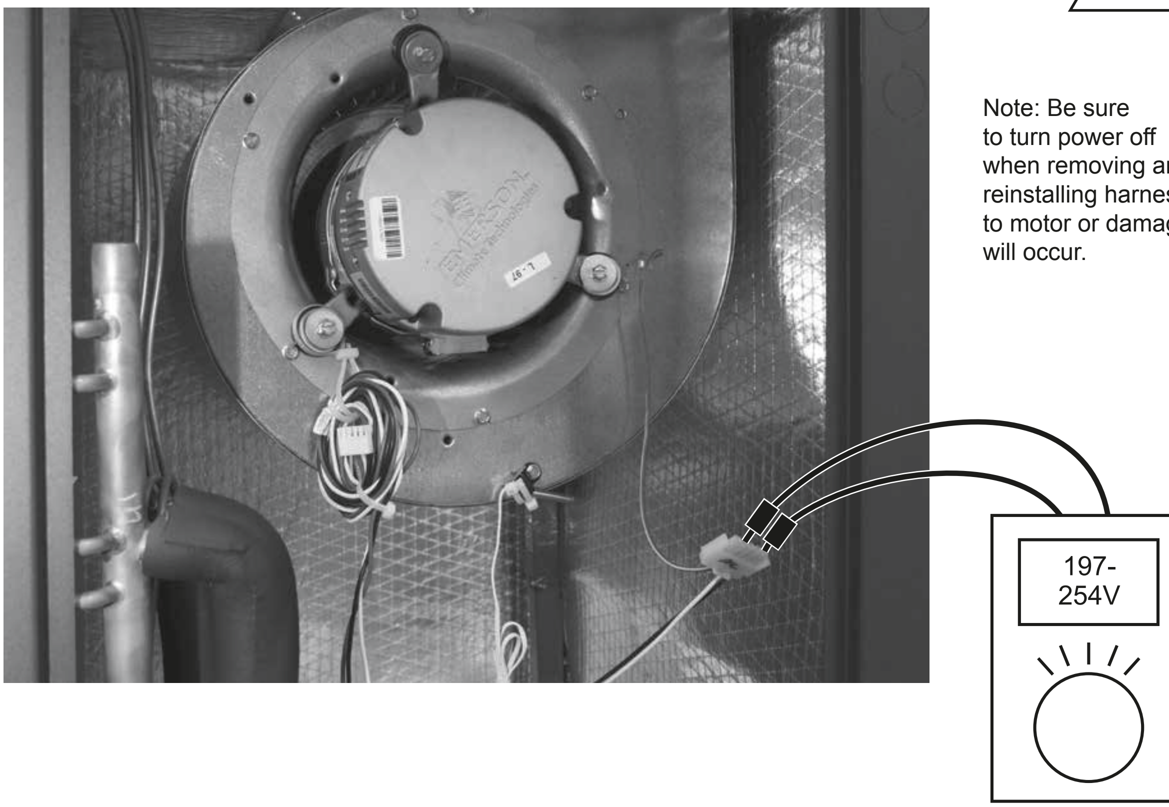
Magnet Test to Shift Reversing Valve into Cooling

Use a magnet to pull the internal slide to one side or another.



Checking Blower Line Voltage

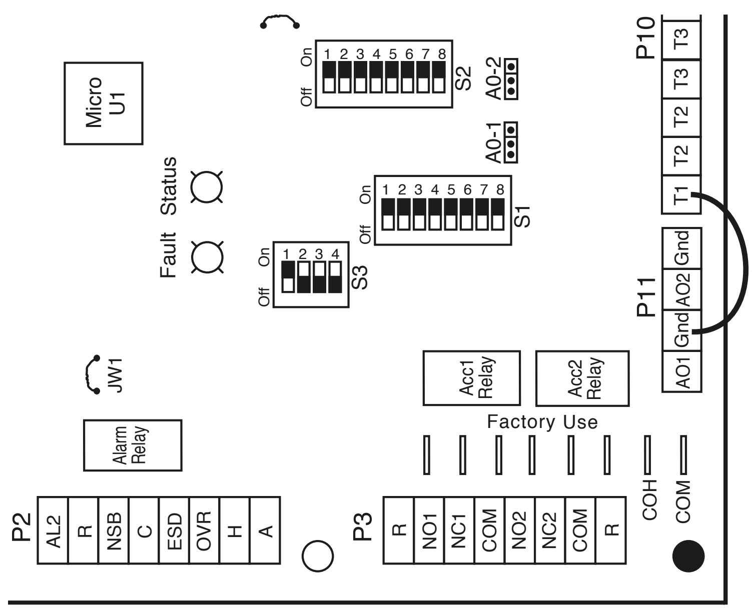
B-I



For a Modulating Valve that Loses Configuration on Thermostat

B-J

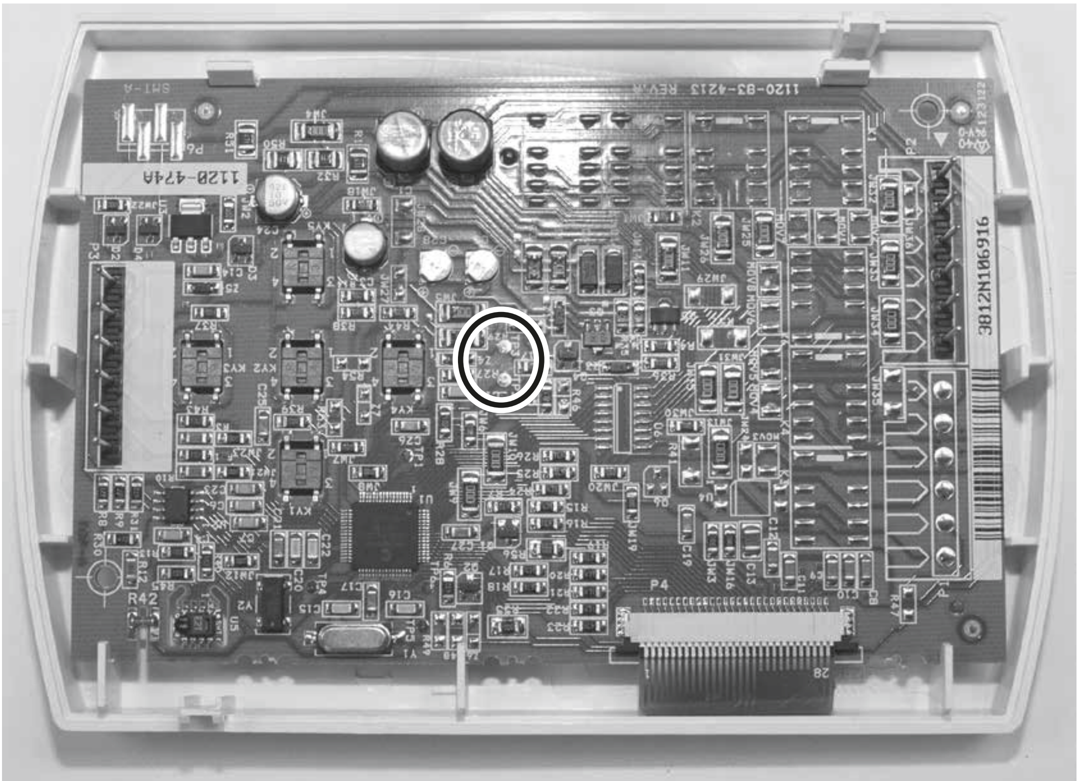
In order to have your thermostat acknowledge that the unit has a modulating valve instead of incorrectly showing a variable-speed pump, connect a piece of thermostat wire between GND and T1 so the DXM2 board does not see feedback.

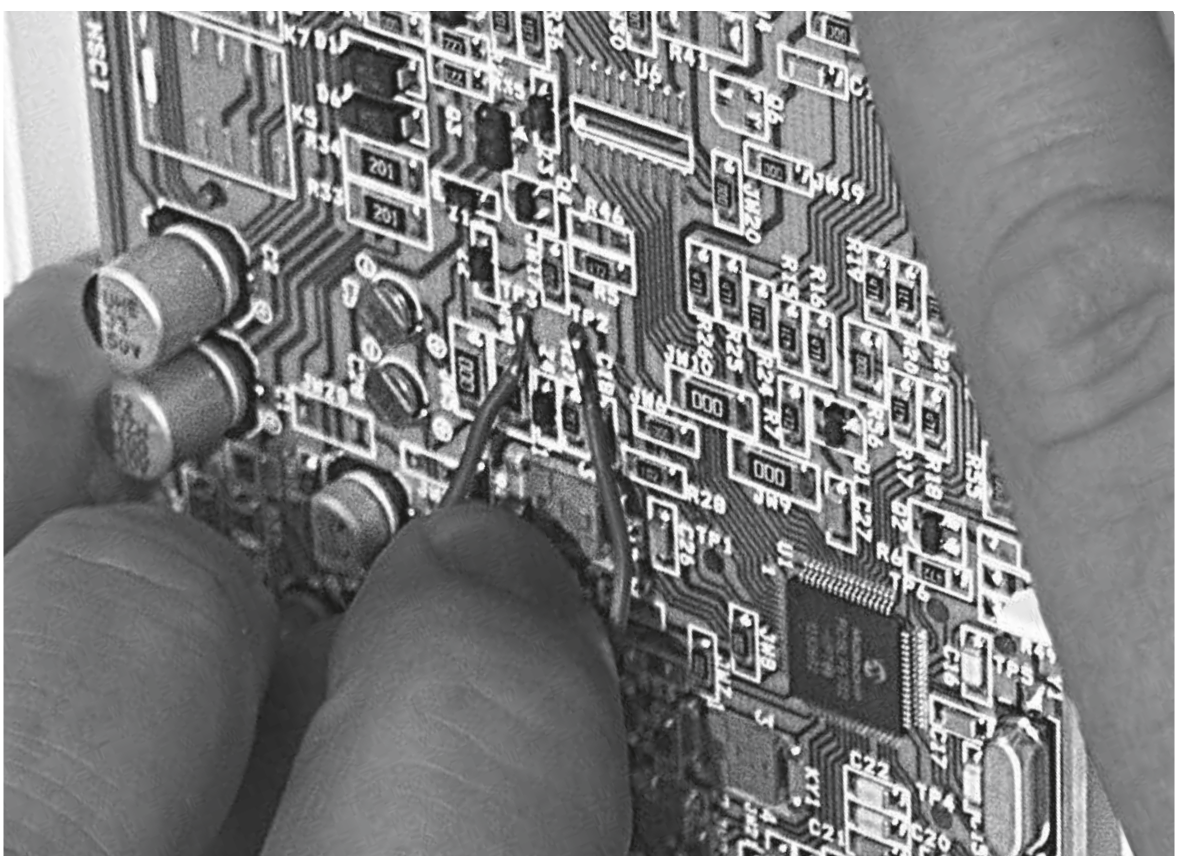


B-K

Hard Reset of Thermostat

Use a thermostat wire to connect TP2 and TP3 on the thermostat board.

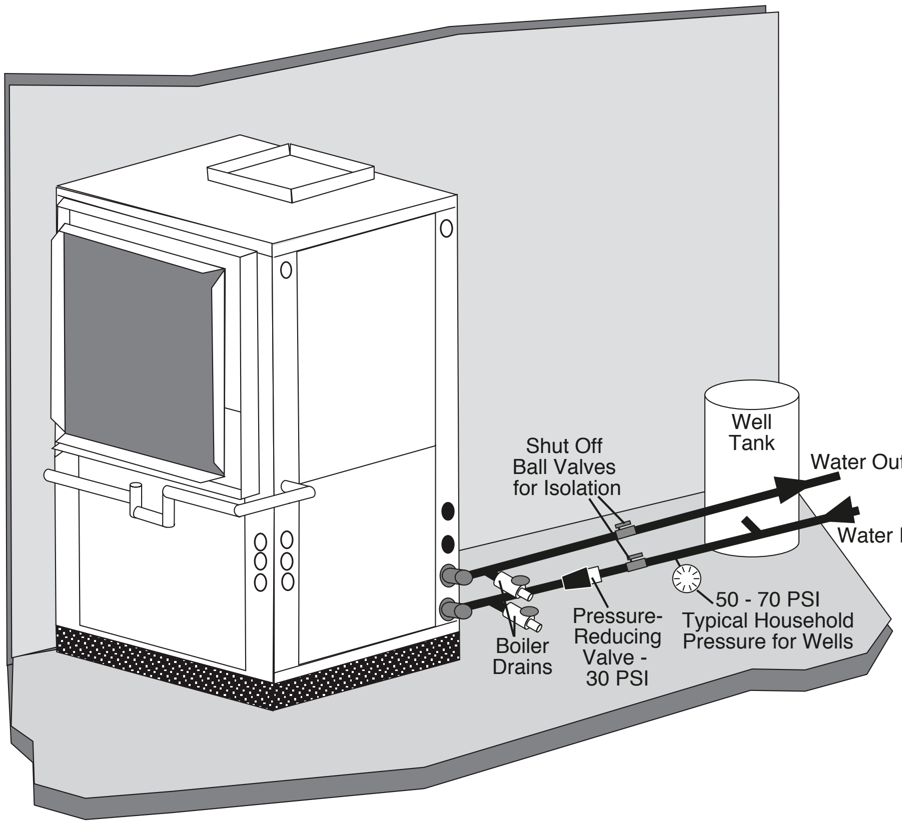




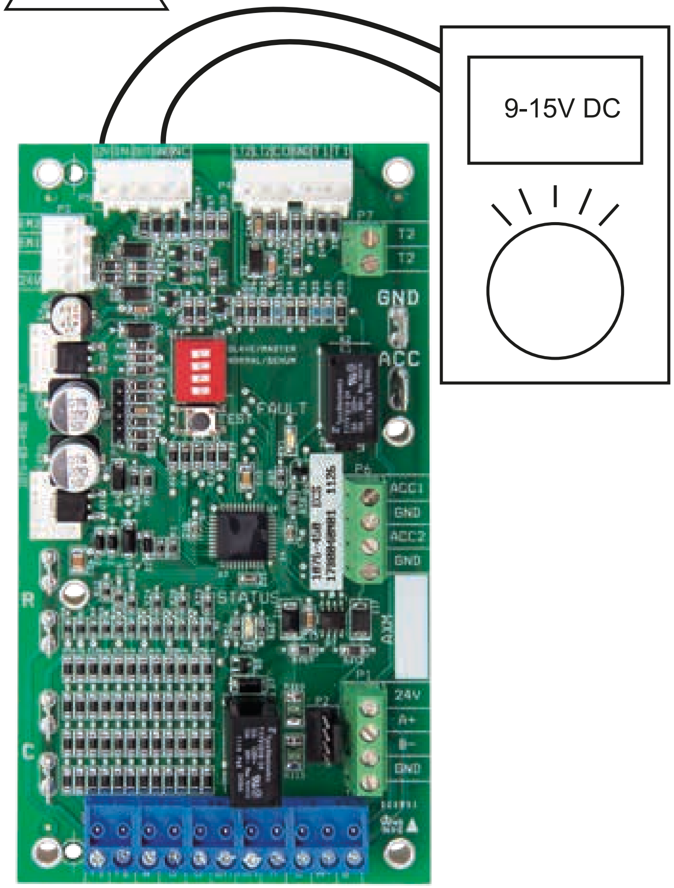
Units Having LT1 Lockouts In Heating with Modulating Valve (Open Loop)

B-L

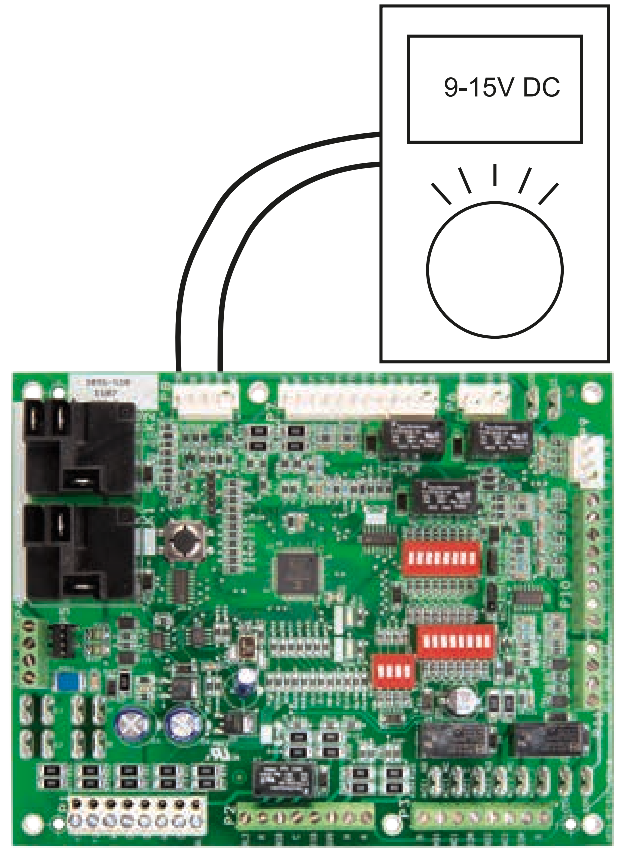
When running unit in Y1 and Y2, if valve position moves slightly below 50% open, there is a greater impact on GPM. Putting a pressure-reducing valve ahead of heat pump will prevent valve from moving below 50% open. Set pressure reducing valve to 30 PSI.



B-M Electrical—Power Wiring



AXM

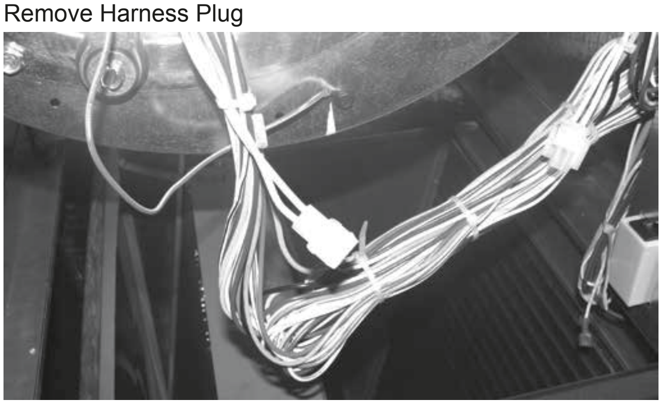


DXM2

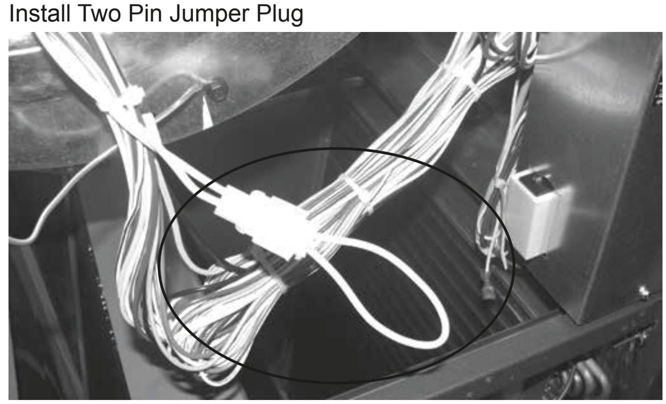
Note: Check the unit voltage with the harness connected and unit powered up.

B-N Electrical—Power Wiring

Remove Harness Plug



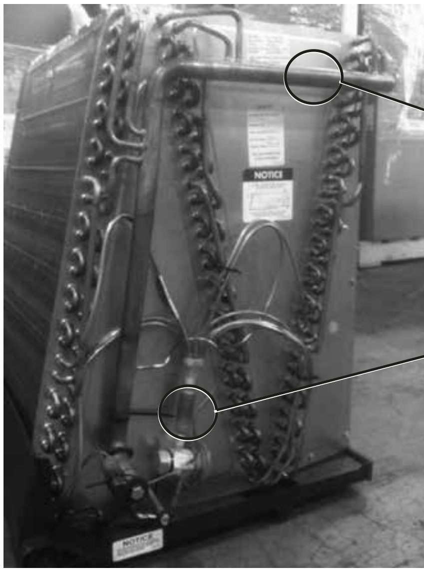
Install Two Pin Jumper Plug



Note: For 115v power only. Damage will occur to motor with 230v power supply if 115v jumper is used.

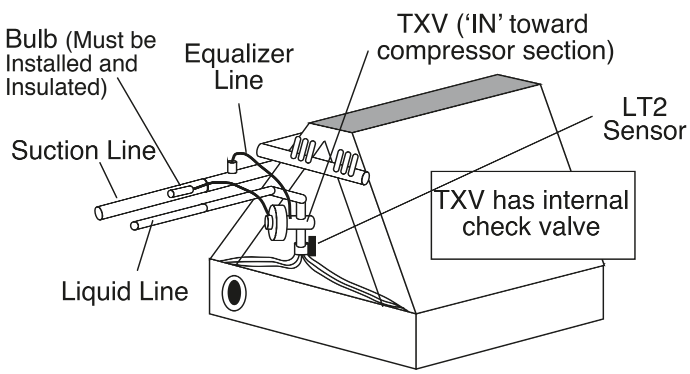
LT2 Sensor Location for Non-TAH Air Handlers

B-O



Air Coil Connection

B-P



Sensing Bulb
IMPORTANT: DO NOT perform any brazing with the TXV bulb attached to any line. After brazing operations have been completed, clamp the TXV bulb securely on the suction line at the 10 or 2 o'clock position with the strap provided in the parts bag. Insulate the TXV sensing bulb and suction line with the provided pressure sensitive insulation (size 4" x 7").
IMPORTANT: TXV sensing bulb should be located on a horizontal section of suction line, just outside of coil box.
IMPORTANT: Always protect TXV from heat when brazing.
IMPORTANT: TXV sensing bulb is shipped unattached. Installer must attach bulb to suction line after brazing and cooling line for proper unit operation.

Lineset Diameters and Charge Information

B-Q

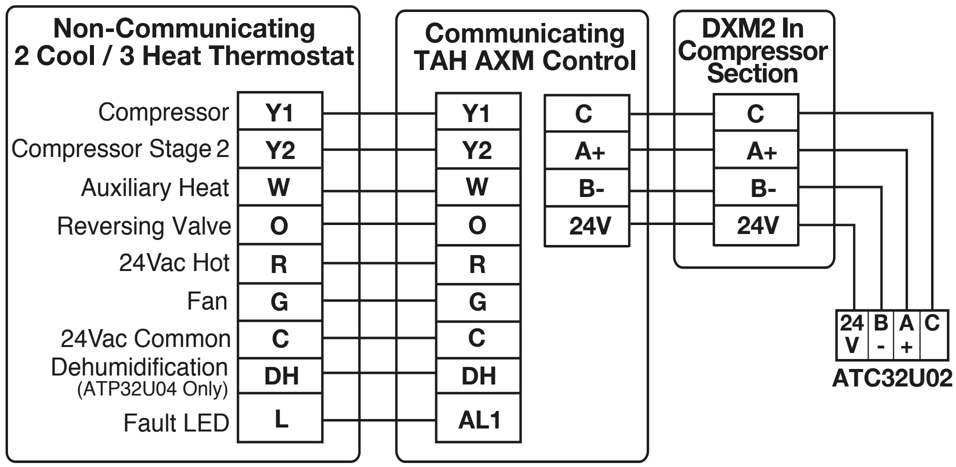
Model	Factory† Charge (oz) [kg]	Basic* Charge (oz) [kg]	20 Feet [6 meters]		40 Feet [12 meters]		60 Feet [18 meters]	
			Liquid	Suction	Liquid	Suction	Liquid	Suction
TES/TEP Series								
026	93 [2.64]	78 [2.21]	3/8"	3/4"	3/8"	3/4"	3/8"	3/4"
038	120 [3.40]	105 [2.98]	3/8"	7/8"	3/8"	7/8"	3/8"	7/8"
049	137 [3.88]	122 [3.46]	3/8"	7/8"	3/8"	7/8"	3/8"	7/8"
064	212 [6.01]	182 [5.16]	1/2"	7/8"	1/2"	7/8"	1/2"	7/8"

• Basic charge includes only the amount required for the condensing unit and the evaporating coil.
An additional amount should be added allowing 0.6oz per ft. for 3/8" [0.6g per cm] and 1.2oz per ft. for 1/2" [1.1g per cm] of lineset used.
†Factory charge is preset for 25' [7.6 meters] lineset.

B-R

Connection to Non-Communicating thermostat and AXM communicating control in Tranquility® Digital Air Handler

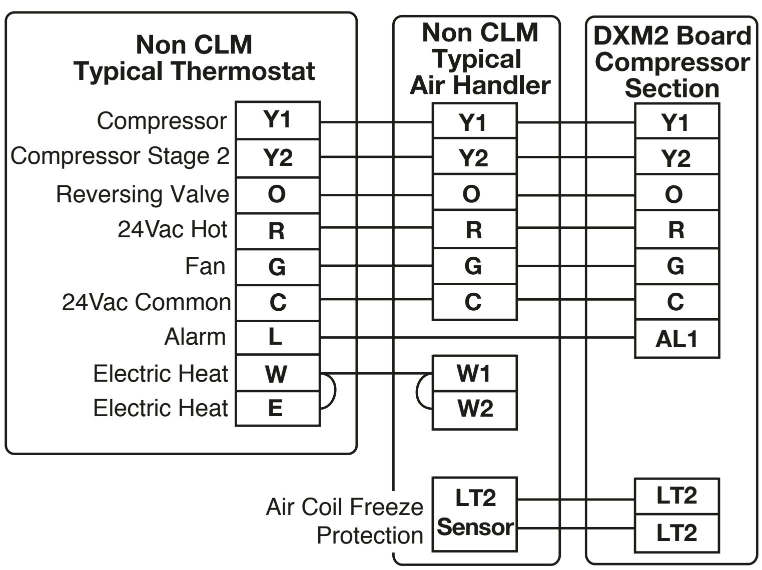
Non-communicating thermostat with communicating compressor section and communicating air handler



Thermostat Connections

C	24V Common for Control Circuit
R	24V Supply for Control Circuit
A+	Communications (Positive)
B –	Communications (Negative)

68.



Note: LT2 sensor is shipped on both TES and TEP.

Thermostat Connections

C	24V Common for Control Circuit
R	24V Supply for Control Circuit
A+	Communications (Positive)
B –	Communications (Negative)

Definitions of Conditions

CONTACTOR OPEN - NOT BUZZING
When the contactor is open but not buzzing, it is an indication of no voltage to its coil, or that there is voltage to its coil but the coil is open circulated. If unit does not start, check voltage at coil with volt meter. If there is voltage, the coil is open circulated. Replace the contactor. If no voltage, check power to control circuit.

LOW SUCTION PRESSURE
If low suction pressure is suspected, switch to heating mode and check the suction pressure. This suction pressure should not be lower than the refrigerant pressure equivalent to entering water temperature minus 40°F, provided there is adequate water flow and entering air is approximately at 70°F.

OPEN HIGH PRESSURE SWITCH
It is factory set to shut down the unit at 600 PSI.

EXCESSIVE DISCHARGE PRESSURE
If excessive discharge pressure is suspected, switch to heating mode and check the discharge pressure. This discharge pressure should not be higher than the refrigerant pressure equivalent to entering air dry bulb temperature plus 60°F, provided there is proper air flow and entering water temperature is approximately at 70°F.

COMPRESSOR OVERLOADS OPEN AND CLOSE
The purpose of overloads is to quickly sense excessive compressor current and/or temperature and open the power circuit to prevent burnout of motor. This condition may be caused by repeated call to start before pressures equalize, low voltage, tightness of new compressor, excessive current draw or the temperature of the suction gas being too warm to adequately cool the motor. Warm suction gas may be due to an under charge, too much superheat, restriction in liquid or suction line, or restriction in capillary. When the overload opens, it may take from 5 to 30 minutes for it to cool sufficiently to close.

CONTACTOR OPEN - BUZZING
When the contactor is open but buzzing, it is an indication that its coil is energized but the contactor is unable to close.

NORMAL VOLTAGE TO COIL
Check voltage to coil. It should not be lower than 10% below rated voltage as the contractor tries to close. If voltage is normal, the mechanism may be tight or fouled. Remove and inspect mechanism. Clean if necessary. If too sluggish, replace contactor.

BELOW NORMAL VOLTAGE TO COIL
Check voltage to coil. If it is lower than 10% below rated voltage, it is probably due to low supply voltage, faulty transformer or phase loss.

OPEN OVERLOAD SWITCH
Sometimes overloads will fail with contacts in the open position, or contacts may be closed but not conducting electrically. To check this, disconnect power circuit. If unit starts, replace overload if it is located in the electrical box. If unit does not start, the trouble is elsewhere.

BURNED CONTACTS
Sometimes contacts will close mechanically but will not conduct electrically. To check for this, disconnect power circuit and measure contact resistance with ohmmeter. The meter should read zero ohms. If meter does not read zero ohms, replace contactor. If ohmmeter is not available, disconnect power circuit, place temporary jumpers from line side of contacts and close power circuit. If unit starts, replace contactor. If unit does not start, trouble is elsewhere. Burned contacts may also cause high current draw.

EXPANSION VALVE BULB LOST CHARGE

A-Y

If the bulb of the expansion valve loses its charge, there will be no pressure to open the valve, thus causing low suction pressure. To check this, remove expansion valve bulb from suction line and hold it in your hand. If the suction pressure does not increase in a few minutes and there are no restrictions in the refrigerant circuit, it is an indication that the bulb has lost its charge. Replace expansion valve.

DISTRIBUTOR TUBE RESTRICTED
To check this, check suction pressure (very low suction pressure is an indication of restriction or excessive under charge) on cooling cycle temporarily cut off air to air coil and allow unit to operate. If there is a partial restriction or excessive undercharge, frost will occur at that point. If there is no restriction, the evaporator coil will frost uniformly. If there is a total restriction anywhere in the refrigerant circuit from the condenser through the evaporator and back to the compressor, there will be no frost, the suction pressure may go into vacuum and the discharge pressure will correspond to approximately ambient temperature because there will be no vapor to compress.

EXCESSIVE SUPERHEAT
Superheat is the temperature of the refrigerant vapor above the temperature corresponding to the vapor pressure. It should be 3° to 25°F. Excessive superheat is an indication that the evaporator is “starved”. That is, not enough liquid refrigerant in the coil. Excessive superheat may be due to undercharge, restriction in refrigerant circuit, low discharge pressure, expansion valve bulb lost charge, too much load on evaporator, or refrigerant flashing ahead of expansion valve or capillary due to pressure drop.

HIGH AMPS
Refer to nameplate on unit. Amps should not exceed rating more than 10%.

POOR EXPANSION VALVE BULB INSTALLATION

A-H

The expansion valve bulb should be securely mounted and properly located on clean pipe, parallel to pipe with firm metal contact and wrapped with insulation tape to assure proper sensing of suction line temperature.

Definitions of Conditions

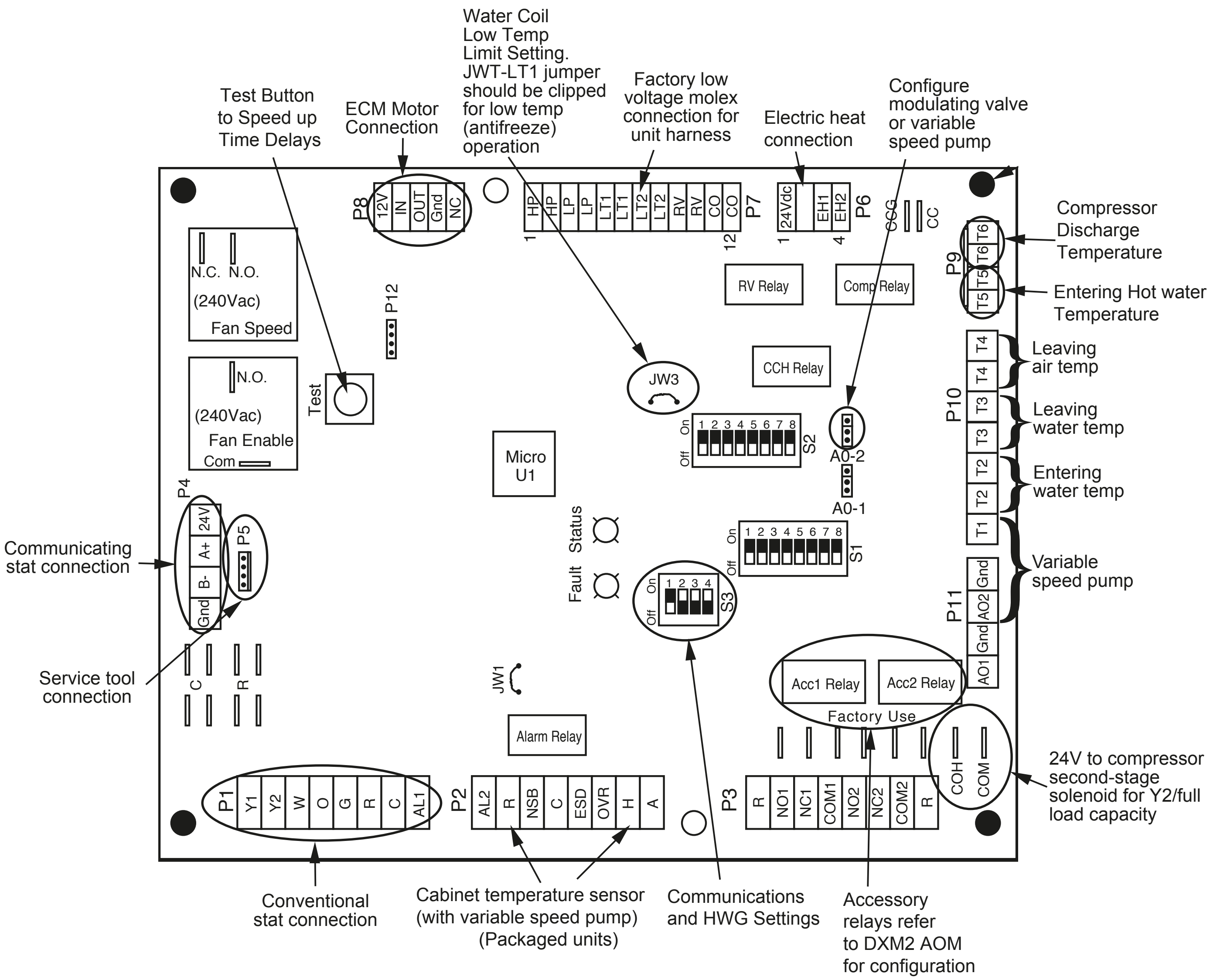
MOTOR WINDINGS OVERHEATED
When the compressor is drawing normal amps and becomes overheated and cycles by the overload, it is due to the temperature of the suction gas being too high to remove heat from the compressor motor. This in turn is due to undercharge, superheat too high or restriction in refrigerant circuit.

HIGH OR LOW VOLTAGE
Check nameplate on unit for voltage rating. Check voltage at contactor or starter while the unit is operating. This voltage should not vary by more than 10% plus or minus from nameplate.

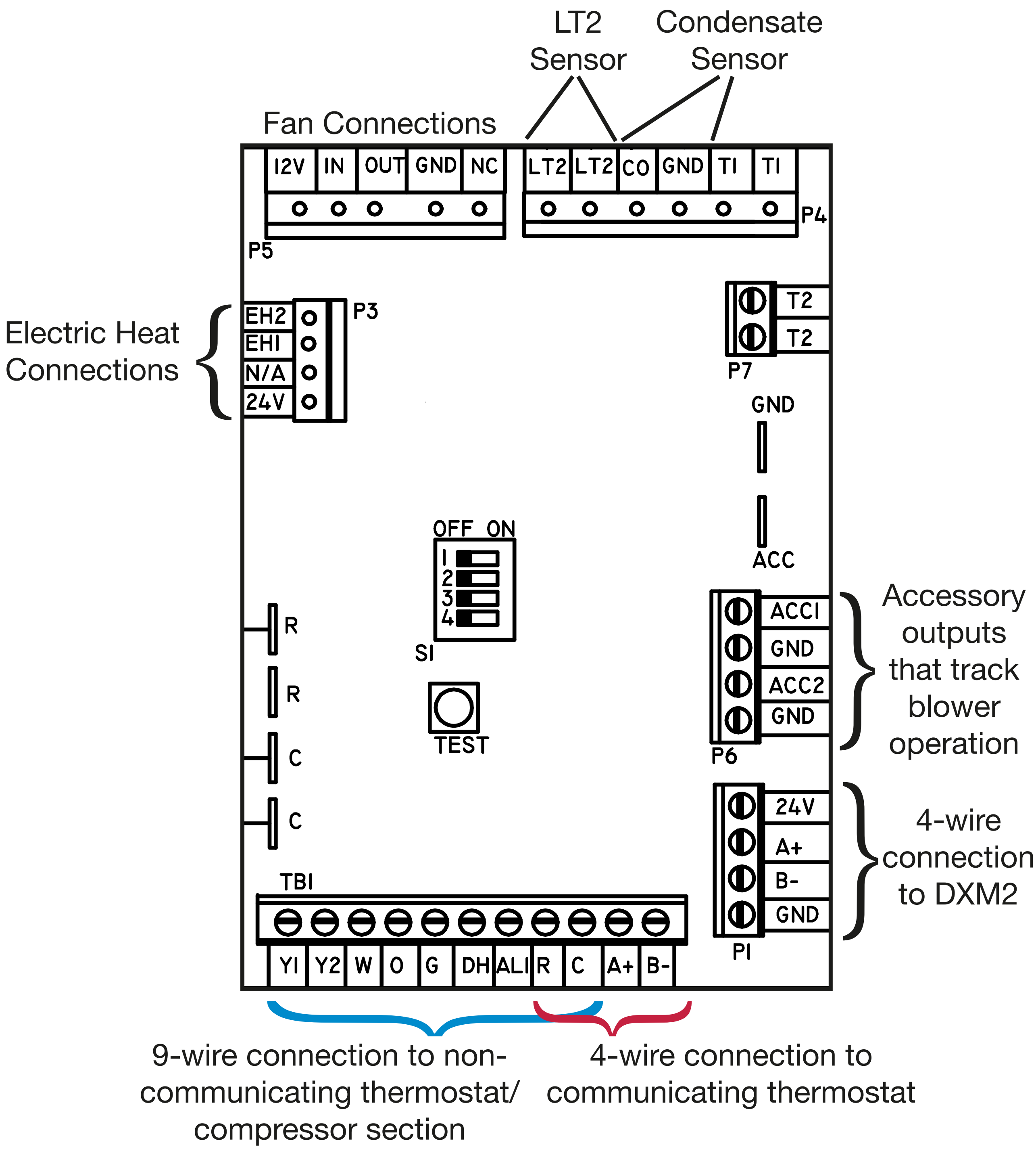
EXPANSION VALVE EQUALIZER LINE RESTRICTED
Check the equalizer line visually for external damage.

EXPANSION VALVE DIAPHRAGM CASE COLDER THAN THE BULB
If the diaphragm case becomes colder than the bulb, the charge will leave the bulb and condense in the diaphragm case. Thus, bulb control will be lost.

DXM2 Board Layout and Dipswitches



AXM Board Layout and Dipswitches



FIELD SELECTABLE INPUTS

Test mode: Test mode allows the service technician to check the operation of the control in a timely manner. By **momentarily** pressing the TEST pushbutton, the DXM2 control enters a 20 minute test mode period in which all time delays are sped up 15 times. Upon entering test mode, the Status and Fault LED displays will change. The Status LED will either flash rapidly to indicate the control is in the test mode, or display a numeric flash code representing the current airflow if an ECM blower is connected and operating. The Fault LED will display the most recent fault condition in memory. Note: A flash code of 1 indicates there have been no faults stored in memory.

For diagnostic ease at conventional thermostats, the alarm relay will also cycle during test mode. The alarm relay will cycle on and off similar to the Fault LED to indicate a code representing the last fault, at the thermostat.

The test mode can be exited by pressing the TEST pushbutton for 3 seconds. The test Mode can also be entered and exited by cycling the G input, 3 times within a 60 second time period.

During Test Mode, the control monitors to see if the LT1 and LT2 thermistors are connected and operating properly. If the control is in Test Mode, the control will lockout, with Code 9, after 60 seconds if:

a) the compressor is On in Cooling Mode and the LT1 sensor is colder than the LT2 sensor. or,

b) the compressor is On in Heating Mode and the LT2 sensor is colder than the LT1 sensor.

Retry Mode: If the control is attempting a retry of a fault, the Fault LED will slow flash (slow flash = one flash every 2 seconds) to indicate the control is in the process of retrying.

Field Configuration Options - Note: In the following field configuration options, jumper wires should be clipped ONLY when power is removed from the DXM2 control.

Note: Jumper 3 must not be clipped prior to adding antifreeze to the water loop. Antifreeze protection to 10°F required. Clipping JW3 without antifreeze may result in freeze damage and will void the unit warranty.

Water coil low temperature limit setting: Jumper 3 (JW3-LT1 Low Temp) provides field selection of temperature limit setting for LT1 of 30°F or 10°F [-1°F or -12°C] (refrigerant temperature).

Not Clipped = 30°F. Clipped = 10°F.

Alarm Relay Setting - Jumper 1 (JW1-AL2 Dry) provides field selection of alarm function when Alarm Relay is energized.

Not Clipped = AL1 connected to R (24VAC) with Alarm Relay active.

Clipped = Dry contact connection between AL1 and AL2 with Alarm Relay active.

JUMPERS (Set at Factory)

A0-2: Configure Modulating Valve or Variable-Speed Pump (vFlow™ Models Only)

Set A0-2 jumper (see Figure on page 5) to “0 - 10v” if using Internal Modulating Motorized Valve <u>or</u> “PWM” if using Internal Variable-Speed Pump. This applies only to vFlow™ units with Internal Speed Water Flow Control.

DIP SWITCHES

Note: In the following field configuration options, DIP switches should only be moved when power is removed from the DXM2 Control to ensure proper operation.

DIP Package #1 (S1)

DIP Package #1 is 8 position and provides the following setup selections.

DIP 1.1: Unit Performance Sentinel Disable - Provides field selection to disable the UPS feature.

On = Enabled. Off = Disabled.

DIP 1.2: Compressor Relay Staging Operation - Provides selection of Compressor Relay staging operation. The Compressor Relay can be selected to turn on with Stage 1 or Stage 2 call from the thermostat. This is used with Dual Stage units (2 compressors where 2 DXM2 Controls are being used) or with master/slave applications. In master/slave applications, each compressor and fan will stage according to its appropriate DIP 1.2. If set to stage 2, the compressor will have a 3 second on-delay before energizing during a Stage 2 demand. Also, if set for stage 2, the Alarm Relay will NOT cycle during Test Mode.

On = Stage 1. Off = Stage 2.

DIP 1.3: Thermostat Type (Heat/Cool) - Provides selection of thermostat type. Heat Pump or Heat/Cool thermostats can be selected. When in Heat/Cool Mode, Y1 is input call for Cooling Stage 1, Y2 is input call for Cooling Stage 2, W1 is input call for Heating Stage 1, and O/W2 is input call for Heating Stage 2. In Heat Pump Mode, Y1 is input call for Compressor Stage 1, Y2 is input call for Compressor Stage 2, W1 is input call for Heating Stage 3 or Emergency Heat, and O/W2 is the input call for RV (heating or cooling dependent upon DIP 1.4).

On = Heat Pump. Off = Heat/Cool.

DIP 1.4: Thermostat Type (O/B) - Provides selection of thermostat type. Heat pump thermostats with “O” output on with Cooling or “B” output on with Heating can be selected.

On = HP Stat with O output with cooling. Off = HP Stat with B output with heating.

DIP 1.5: Dehumidification Mode - Provides selection of normal or Dehumidification Fan Mode. In Dehumidification Mode, the fan speed will be adjusted for Cooling. In Normal Mode, the fan speed will be normal during Cooling.

DXM2 Controls

On = Normal Fan Mode. Off = Dehumidification Mode.

DIP 1.6: DDC Output at EH2 - DIP Switch 1.6 provides selection for DDC operation. If set to DDC Output at EH2, the EH2 terminal will continuously output the last fault code of the controller. If set to EH2 normal, then the EH2 will operate as standard electric heat output.

On = EH2 Normal. Off = DDC Output at EH2.

DIP 1.7: Boilerless Operation - Provides selection of Boilerless Operation. In Boilerless Mode, only the compressor is used for Heating Mode when LT1 is above the temperature specified by the setting of DIP 1.8. If DIP 1.8 is set for 50°F, then the compressor is used for heating as long as LT1 is above 50°F. Below 50°F, the compressor is not used and the control goes into Emergency Heat Mode, staging on EH1 and EH2 to provide heating.

On = normal. Off = Boilerless operation.

DIP 1.8: Boilerless Changeover Temperature - Provides selection of boilerless changeover temperature setpoint.

On = 50°F. Off = 40°F.

DIP Package #2 (S2)

DIP Package #2 is 8 position and provides the following setup selections.

DIP Package #2 (S2) - A combination of dip switches 2.1, 2.2, 2.3, and 2.4, 2.5, 2.6 deliver configuration of ACC1 and ACC2 relay options respectively. See Table 7a for description and functionality.

DIP 2.7: Auto Dehumidification Fan Mode or High Fan Mode - Provides selection of Auto Dehumidification Fan Mode or High Fan Mode. In Auto Dehumidification Mode, the Fan Speed will be adjusted during Cooling IF the H input is active. In High Fan Mode, the Fan will operate on high speed when the H input is active.

On = Auto Dehumidification Mode (default). Off = High Fan Mode.

DIP 2.8: Factory Setting - Normal position is On. Do not change selection unless instructed to do so by the Factory.

DIP Package #3 (S3)

DIP Package #3 is 4 position and provides the following setup selections.

DIP 3.1: Communications configuration: Provides selection of the DXM2 operation in a communicating system. The DXM2 may operate as a communicating master or slave device depending on the network configuration. In most configurations, the DXM2 will operate as a master device.

On = Communicating Master device (default). Off = communicating Slave device.

Table 1: Accessory Relay 1 Configuration

DIP 2.1	DIP 2.2	DIP 2.3	ACC1 Relay Option
ON	ON	ON	Cycle with fan
OFF	ON	ON	Digital night setback
ON	OFF	ON	Water valve – Slow opening
ON	ON	OFF	Outside air damper
OFF	ON	OFF	Dedicated Dehumidification Mode option – Dehumidistat
OFF	OFF	OFF	Dedicated Dehumidification Mode option – Humidistat
OFF	OFF	ON	Hydronic Economizer – 1st Stage
ON	OFF	OFF	Hydronic Economizer – Both Stages

All other DIP combinations are invalid

Table 2: Accessory Relay 2 Configuration

DIP 2.4	DIP 2.5	DIP 2.6	ACC2 Relay Option
ON	ON	ON	Cycle with compressor
OFF	ON	ON	Digital night setback
ON	OFF	ON	Water valve – Slow opening
OFF	OFF	ON	Humidifier
ON	ON	OFF	Outside air damper

All other DIP combinations are invalid

DIP 3.2: HWG Test Mode: Provides forced operation of the HWG pump output, activating the HWG pump output for up to five minutes.

On = HWG test mode. Off = Normal HWG mode (default).

DIP 3.3: HWG Temperature: Provides the selection of the HWG operating setpoint.

On = 150°F [66°C]. Off = 125°F [52°C] (default).

DIP 3.4: HWG Status: Provides HWG operation control.

On = HWG mode enabled. Off = HWG mode disabled (default).

SAFETY FEATURES

The following safety features are provided to protect the compressor, heat exchangers, wiring and other components from damage caused by operation outside of design conditions.

Anti-Short Cycle Protection - The control features a 5 minute anti-short cycle protection for the compressor.

Note: The 5 minute anti-short cycle also occurs at power up.

Random Start - The control features a 5-80 second random start upon power up. The random start delay will be present after a control power up and after returning from Night Setback or Emergency Shutdown modes.

Extended Compressor Operation Monitoring - If the compressor relay has been on for 4 continuous hours, then the control will automatically turn off the compressor relay and wait the short cycle protection time. All appropriate safeties will be monitored during the off time. If all operation is normal, and if the compressor demand is still present, the control will turn the compressor back on.

Fault Retry - In Fault Retry Mode, the Fault LED begins slow flashing to signal that the control is trying to recover from a fault input. The DXM2 Control will stage off the outputs and then "try again" to satisfy the thermostat call for compressor.

⚠ CAUTION! ⚠

CAUTION! Do not restart units without inspection and remedy of faulting condition. Equipment damage may occur.

Once the thermostat input calls are satisfied, the control will continue on as if no fault occurred. If 3 consecutive faults occur without satisfying the thermostat call for compressor, then the control will go to Lockout Mode. The last fault causing the lockout will be stored in memory and is displayed at the Fault LED by entering the Test mode.

Note: LT1 and LT2 faults are factory set for one try, so there will be no "retries" for LT1 and LT2 faults. The control will only try one time for these faults.

FAULT CODES

Lockout - In Lockout Mode, the Fault LED will begin fast flashing. The compressor relay is turned off immediately. The fan output will be turned off after the current blower off delay unless auxiliary heat is active. The Lockout Mode can be "soft" reset via the thermostat by removing the call for compressor, or by a "hard" reset (disconnecting power to the control). The fault code will be stored in non-volatile memory that can be displayed by the Fault LED by entering the Test mode, even if power was removed from the control.

Lockout with Emergency Heat - If the DXM2 is configured for Heat Pump thermostat Mode (see DIP 1.3), the DXM2 is in Lockout Mode, and the W input becomes active, then Emergency Heat Mode will occur during Lockout. For Emergency Heat, the fan and auxiliary heat outputs will be activated.

Fault Code 2: High Pressure Switch – When the High Pressure switch opens due to high refrigerant pressures, the compressor relay is de–energized immediately. The High Pressure fault recognition is immediate (does not delay for 30 continuous seconds before de–energizing the compressor). When the Test mode is activated, the Fault LED will display a fault code of 2 for a High Pressure fault.

Fault Code 3: Loss of Charge Switch – The Loss of Charge Switch must be open and remain open for 30 continuous seconds during a compressor "on" cycle to be recognized as a Loss of Charge fault. If the Loss of Charge switch is open for 30 seconds prior to compressor power up it will be considered a Loss of Charge fault. The Loss of Charge Switch input is bypassed for the initial 120 seconds of a compressor run cycle. When the Test mode is active, the Fault LED will display a fault code of 3 for a Loss of Charge fault.

Fault Code 4: Water Coil Low Temperature Cut-Out Limit (LT1) - The control will recognize an LT1 fault, during a compressor run cycle if:

a) the LT1 thermistor temperature is below the selected low temperature protection limit setting for at least 50 seconds, AND

b) the LT1 thermistor temperature is rising (getting warmer) at a rate LESS than 2°F per 30 second time period.

The LT1 input is bypassed for the initial 120 seconds of a compressor run cycle. When the Test mode is active, the Fault LED will display a fault code of 4 for a LT1 fault.

Fault Code 5: Air Coil Low Temperature Cut-Out (LT2) - The control will recognize an LT2 fault, during a compressor run cycle if:

a) the LT2 thermistor temperature is below the low temperature protection limit setting for at least 50 seconds, AND

b) the LT2 thermistor temperature is rising (getting warmer) at a rate LESS than 2°F per 30 second time period.

The LT2 input is bypassed for the initial 120 seconds of a compressor run cycle. When the Test mode is active, the Fault LED will display a fault code of 5 for a LT2 fault.

Fault Code 6: Condensate Overflow - The Condensate Overflow sensor must sense overflow levels for 30 continuous seconds to be recognized as a CO fault. Condensate Overflow will be monitored at all times during the compressor run cycle. When the Test mode is active, the Fault LED will display a fault code of 6 for a Condensate Overflow fault.

Fault Code 7: Over/Under Voltage Shutdown - An Over/Under Voltage condition exists when the control voltage is outside the range of 18VAC to 31.5VAC. Over/UnderVoltage Shutdown is self-resetting in that if the voltage comes back within range of 18.5VAC to 31VAC for at least 0.5 seconds, then normal operation is restored. This is not considered a fault or lockout. If the DXM2 is in over/under voltage shutdown for 15 minutes, the Alarm Relay will close. When the Test mode is active, the Fault LED will display a fault code of 7 for an Over/Under Voltage Shutdown.

DXM2 Controls

Fault Code 8: Unit Performance Sentinel – UPS – The UPS feature warns when the heat pump is operating inefficiently. A UPS condition exists when:

a) In Heating Mode with compressor energized, if LT2 is greater than 125°F for 30 continuous seconds, or

b) In Cooling Mode with compressor energized, if LT1 is greater than 125°F for 30 continuous seconds, OR LT2 is less than 40°F for 30 continuous seconds.

If a UPS condition occurs, the control will immediately go to UPS warning. The status LED will remain on as if the control is in Normal Mode. (see "LED and Alarm Relay Operation Table"). Outputs of the control, excluding Fault LED and Alarm Relay, will NOT be affected by UPS. The UPS condition cannot occur during a compressor off cycle. During UPS warning, the Alarm Relay will cycle on and off. The cycle rate will be On for 5 seconds, Off for 25 seconds, On for 5 seconds, Off for 25 seconds, etc. When the Test mode is active, the Fault LED will display a fault code of 8 for an UPS condition.

Fault Code 9: Swapped LT1/LT2 Thermistors - During Test Mode, the control monitors to see if the LT1 and LT2 thermistors are connected and operating properly. If the control is in Test Mode, the control will lockout, with Code 9, after 60 seconds if:

a) the compressor is On in Cooling Mode and the LT1 sensor is colder than the LT2 sensor. Or,

b) the compressor is On in Heating Mode and the LT2 sensor is colder than the LT1 sensor.

When the Test mode is active, the Fault LED will display a fault code of 9 for a Swapped Thermistor fault.

Fault Code 10: ECM Blower Fault – When operating an ECM blower, there are two types of ECM Blower fault conditions that may be detected.

a) An ECM blower fault will be detected and the control will lockout after 15 seconds of blower operation with the blower feedback signal reading less than 100 RPM.

b) An ECM blower fault will be detected when the ECM configuration is incorrect or incomplete. For this fault condition, the control will continue to operate using default operating parameters.

When the Test mode is active, the Fault LED will display a fault code of 10 for an ECM Blower fault.

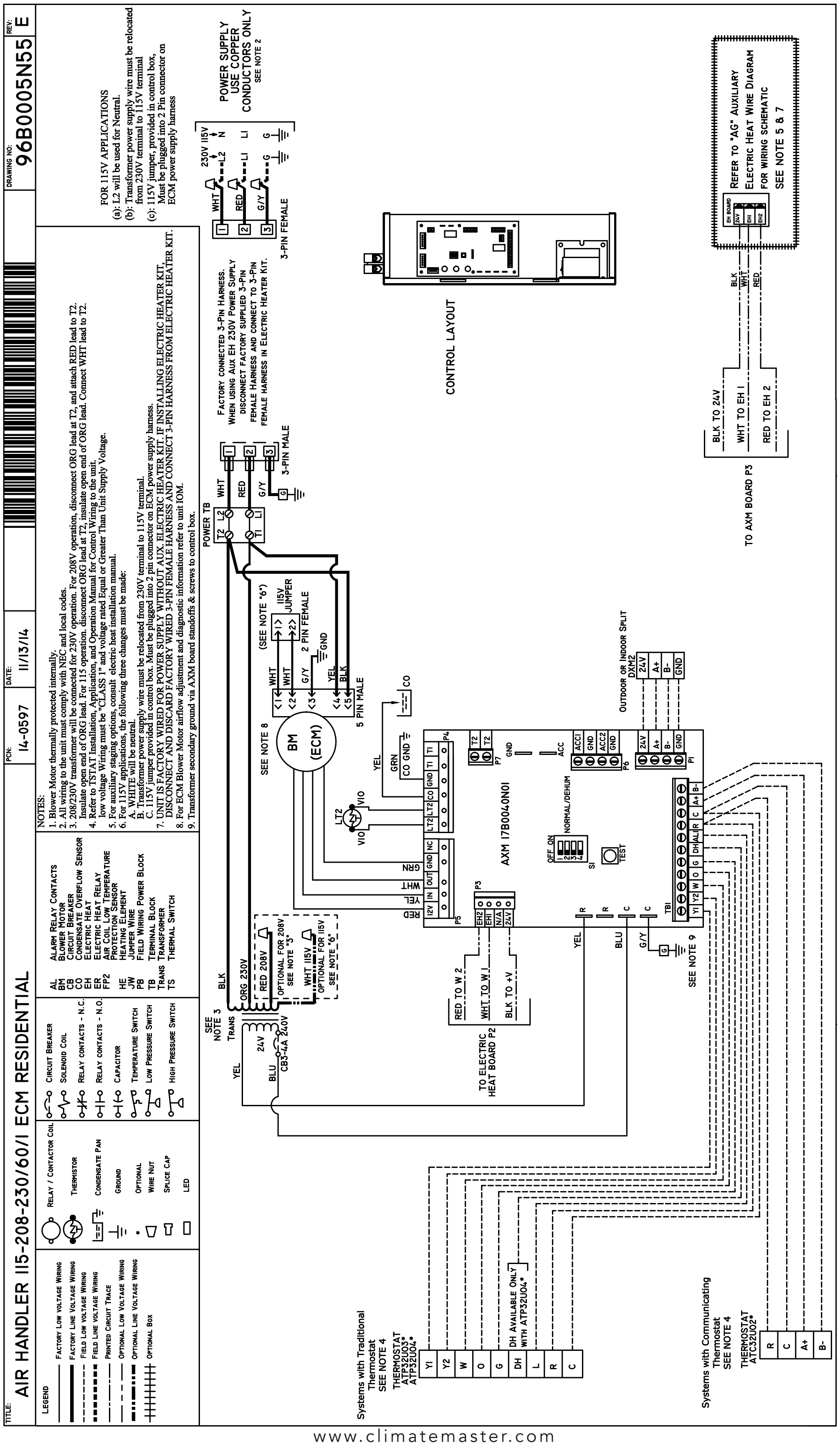
Fault Code 11: Low Air Coil Pressure Switch (Dedicated Dehumidification Mode Units Only) – When the Low Air Coil Pressure switch opens due to low refrigerant pressure in the cooling or reheat operating mode, the compressor relay is de–energized immediately. The Low Air Coil Pressure fault recognition is immediate (does not delay for 30 continuous seconds before de–energizing the compressor). When the Test mode is activated, the Fault LED will display a fault code of 11 for a Low Air Coil Pressure fault. Note: Low Air Coil Pressure fault will keep the unit from operating in the cooling or reheat modes, but heating operation will still operate normally.

Fault Code 12: Low Air Temperature (Dedicated Dehumidification Mode Units Only) – The control will recognize an Low Air Temperature fault, during cooling, reheat, or constant fan operation if the LAT thermistor temperature is below 35 degrees for 30 continuous seconds. When the Test mode is activated, the Fault LED will display a fault code of 12 for a Low Air Temperature fault. Note: Low Air Temperature fault will keep the unit from operating in the cooling, reheat, or constant fan modes, but heating operation will still operate normally.

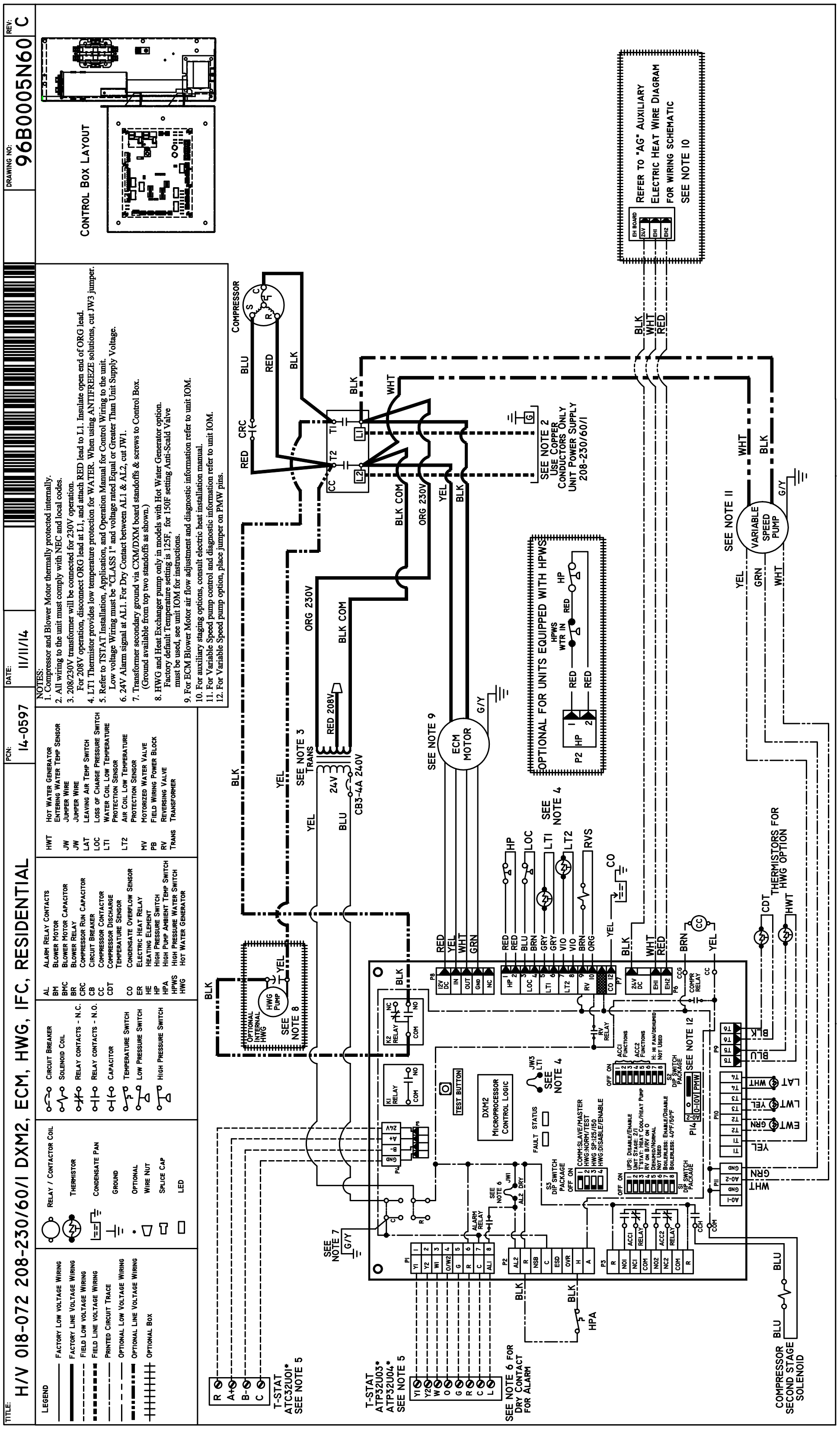
Internal Flow Center Faults – When operating an internal flow center, the DXM2 monitors the pump feedback signal and may detect one of several pump faults. The control may detect locked rotor, low voltage, no flow, or bad pump sensor conditions that will result in an internal flow center fault. When the Test mode is active, the Fault LED will display a fault code of 13 for a internal flow center fault.

ESD – The ESD (Emergency Shut Down) Mode is utilized when the ERV (Energy Recovery Ventilator) option is applied to an TRE series rooftop unit to indicate an ERV fault. A contact closure at the ERV unit will connect common to the ESD terminal, which will shut down the rooftop/ERV units. The green Status LED will flash code 3 when the unit is in ESD Mode. The ESD Mode can also be enabled from an external common signal to terminal ESD (see "Thermostat Inputs" section for details).

Typical Wiring Diagram—96B0005N55

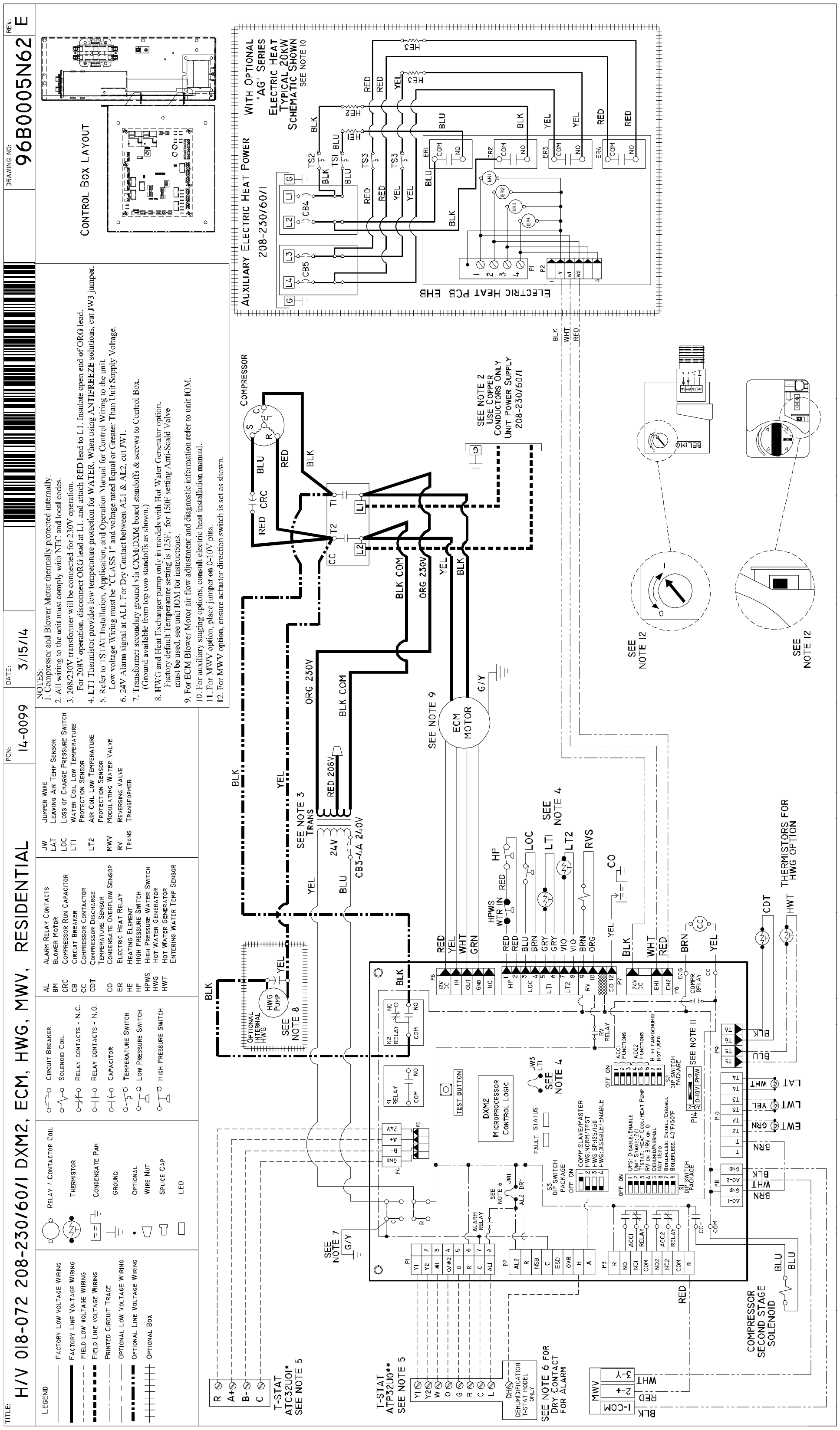


DXM2 Wiring Diagram with Internal Flow Controller - 96B0005N60



This diagram includes typical wiring details but is not applicable to all units. For specific unit wiring, refer to the diagram or the units' control panel.

DXM2 Wiring Diagram with Motorized Modulating Water Valve - 96B0005N62



This diagram includes typical wiring details but is not applicable to all units. For specific unit wiring, refer to the diagram or the units' control panel.

ATC32U02 Thermostat Screens and Set Up

2.0 Installer Menu Settings

2.1 INSTALLER MENU SETTINGS ACCESS

The Installer Settings can be accessed at any time from the Main Operating screen by holding the up/down arrows simultaneously for 5 seconds while the thermostat is in OFF Mode.

Installer Menu Settings Overview

- Thermostat Configuration
- System Configuration
  - Airflow Selection
  - Option Selection
  - Unit Configuration
  - Pump Configuration
  - Valve Configuration
- Accessory Configuration
  - Air Filter
  - Humidifier
  - UV Lamp
  - Air Cleaner
- Input Dealer Information
- Humidity Configuration
- Temperature Algorithm
- Demand Reduction Configuration
- Service Mode
  - Manual Operation
  - Control Diagnostics
  - Dipswitch Configuration
  - Fault History
  - Clear Fault History
- Restore Defaults

2.2 THERMOSTAT CONFIGURATION

Upon initial power up, the communicating thermostat will prompt the installer for the thermostat configuration settings.

Model number and software version of thermostat and software version of connected DXM2 are also displayed on this screen.

INSTALLER SETTINGS
THERMOSTAT CONFIG
SYSTEM CONFIG
ACCESSORY CONFIG
INPUT DEALER INFO
HUMIDITY CONFIG
TEMPERATURE CONTROL
DEMAND REDUCTION CNFG
SERVICE MODE
SETPOINT LIMITS
RESTORE DEFAULTS

DXM2 3.3
ATC32U02 C 1.0
SELECT OPTION ▲▼
◄ PREVIOUS

2.2.1 STAGING

Adjust the staging option using the up/down arrow buttons. Press the center button to save changes.

- **Single Stage** – for control of a single stage compressor applications
- **Multi-Stage (default)** – for control of multi-stage compressor applications

THERMOSTAT CONFIGURATION

SINGLE STAGE

MULTI STAGE

SELECT OPTION ▲▼
◄ PREVIOUS SAVE ■

2.2.2 AUXILIARY HEAT

Adjust the Auxiliary Heat options using the up/down arrow buttons. Press the center button to save changes.

- **Electric (default)** – for control of a system with electric auxiliary heat
- **Multi-Fuel** – for control of a system with furnace for auxiliary heat
- **No Auxiliary Heat** – for control of a system with no auxiliary heat

THERMOSTAT CONFIGURATION

ELECTRIC

MULTI FUEL

NO AUXILIARY HEAT

SELECT OPTION ▲▼
◄ PREVIOUS SAVE ■

2.2.2.1 AUXILIARY HEAT CONFIGURATION

Select Electric Auxiliary Heat mode

- **Auxiliary Heat to Supplement Pump**
- **Auxiliary Heat for Emergency Heat Only**

THERMOSTAT CONFIGURATION

AUXILIARY HEAT TO SUPPLEMENT HEAT PUMP

AUXILIARY HEAT FOR EMERGENCY HEAT ONLY

SELECT OPTION ▲▼
◄ PREVIOUS SAVE ■

3.0 System Configuration

Use the System Configuration option on the start-up screen to adjust critical equipment settings.

The System Configuration information will be automatically obtained from each communicating control in the system.

Note 1: The Airflow Selection menu (section 3.1) will not be present if the connected communicating control system has no blower.

Note 2: The Pump Configuration menu (section 3.4) will not be present if the connected communicating control is configured for No Loop Configuration (OTHER).

Note 3: The Valve Configuration menu (section 3.5) will not be present if the connected communicating control is configured for No Loop Configuration (OTHER).

INSTALLER SETTINGS	
THERMOSTAT CONFIG	
SYSTEM CONFIG	
ACCESSORY CONFIG	
INPUT DEALER INFO	
HUMIDITY CONFIG	
TEMPERATURE CONTROL	
DEMAND REDUCTION CNFG	
SERVICE MODE	
SETPOINT LIMITS	
RESTORE DEFAULTS	
DXM2	3.3
ATC32U02	C 1.0
SELECT OPTION ▲▼	
◄ PREVIOUS	

SYSTEM CONFIGURATION	
AIRFLOW SELECTION	
OPTION SELECTION	
UNIT CONFIG	TE026
PUMP CONFIGURATION	
SELECT OPTION ▲▼	
◄ PREVIOUS	SAVE ■

3.1 AIRFLOW SELECTION

Adjust the airflow settings for each system operating mode using the up/down arrow buttons. Press the center button to select each item.

- **Airflow Settings (defaults stored in control)** - valid range: obtained from control (in 25 CFM increments)
- **Blower Off Delay (default 60 seconds) –** valid range: 0 to 255 seconds (in 5 second increments)

NOTE 1: The Airflow Settings will only be present if the connected communicating control is configured for ECM blower.

NOTE 2: If multiple units are connected to one thermostat, refer to section 3.6 for unit selection.

AIRFLOW SELECTION	CFM
HEAT STAGE 1	600
HEAT STAGE 2	750
AUXILIARY HEAT	850
EMERGENCY HEAT	850
COOL STAGE 1	525
COOL STAGE 2	700
COOL DEHUMID 1	425
COOL DEHUMID 2	550
CONTINUOUS FAN	350
HEAT OFF DELAY	60
COOL OFF DELAY	30
◄ PREVIOUS	NEXT ►

3.2 OPTION SELECTION

This option allows the configuration of heat pump options to be modified.

Adjust the Option settings using the up/down arrow buttons. Press the center button to select each item.

- **Motorized Valve (defaults stored in control) –** valid range: Off, On "On" delays compressor start until the valve is fully open.

NOTE: "Motorized Valve" used here refers to a two-position motorized water valve, not to be confused with the modulating motorized water valve found in the LOOP CONFIG.

- **Compressor ASCD (Anti-Short Cycle Delay (default stored in control) –** valid range: 5 to 8 (in 1 minute increments)

NOTE 1: The Compressor Anti-Short Cycle Delay setting provides equipment protection by forcing the compressor to wait a few minutes before restarting.

NOTE 2: If multiple units are connected to one thermostat, refer to section 3.6 for unit selection.

ATC32U02 Thermostat Screens and Set Up

⚠ CAUTION! ⚠

CAUTION! This is a Commercial option only and does not alter Residential unit operation.

OPTION SELECTION	
MOTORIZED VALVE	OFF
COMPRESSOR ASCD	5
◄ PREVIOUS	NEXT ►

3.3 UNIT CONFIGURATION

Adjust the Unit Configuration settings including Heat Pump Family, Heat Pump Size, Blower Type, and Loop Configuration using the up/down arrow buttons. Press the center button to select each item.

- **Heat Pump Family (default stored in control) –** valid range: TE, TY, TES, TEP, TRT, TSM
- **Heat Pump Size (default stored in control) –** valid range: depends on Heat Pump Family setting
- **Blower Type (default stored in control) –** valid range: NONE, PSC–2SPD, ECM, PSC–1SPD
- **Loop Config (default stored in control) –** valid range: Other, VS PUMP, MOD VALVE

Airflow, pump and valves can be configured from 'System Configuration' screen.

Select 'VS PUMP' when applying an internal variable speed flow controller with other flow controllers on a single loop in parallel.

NOTE: Refer to section 3.6.3 for multi-unit configuration instructions.

UNIT CONFIGURATION	
CURRENT CONFIG	TE026
HEAT PUMP FAMILY	TE
HEAT PUMP SIZE	026
BLOWER TYPE	ECM
LOOP CONFIG	VS PUMP
SELECT OPTION ▲▼	
◄ PREVIOUS	SAVE ■

3.4 PUMP CONFIGURATION

vFlow™ vs internal flow control pump can be controlled either through temperature differential (Delta T) or can be set to specific speed (fixed; % of full speed for each heat and cool stage).

Can be configured for either single pumping or parallel pumping.

Configure temperature differentials at the thermostat for vFlow™ units with an internal flow control pump.

Adjust the Pump Configuration settings using the up/down arrow buttons. Press the center button to select each item.

- **Heating Delta T (default stored in control) –** valid range: 4 to 12ºF (in 1ºF increments)
- **Cooling Delta T (default stored in control) –** valid range: 9 to 20ºF (in 1ºF increments)

Maximum Heat LWT (valid range based on specific model; refer to model IOM). Minimum Cool LWT (valid range based on specific model; refer to model IOM).

NOTE: Refer to section 3.6.3 for multi-unit configuration instructions.

VARIABLE SPD INTERNAL PUMP CONFIGURATION	
LOOP OPTION	PARALLEL
PUMP CONTROL	DELTA T
HEATING DELTA T	7 F
COOLING DELTA T	10 F
MAXIMUM HEAT LWT	80 F
MINIMUM COOL LWT	40 F
◄ PREVIOUS	SELECT ■

To control vs pump by fixed speed, select 'Pump Control', press ■, use down arrow to select 'Fixed', and press ■ to save.

Default stored in control. Valid range: 15% - 90% (in 1% increments)

Heating Stage 1	Cooling Stage 1
Heating Stage 2	Cooling Stage 2

If Loop Option is set to 'PARALLEL', valid range changes to 50-90% (in 1% increments).

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VARIABLE SPD INTERNAL PUMP CONFIGURATION	
LOOP OPTION	SINGLE
PUMP CONTROL	FIXED
HEATING STAGE 1	60%
COOLING STAGE 2	75%
COOLING STAGE 1	50%
COOLING STAGE 2	70%
◀ PREVIOUS	SELECT ■

3.5 VALVE CONFIGURATION

Configure temperature differentials at the thermostat for vFlow™ units with a motorized modulating valve.

Adjust the Valve Configuration settings using the up/down arrow buttons. Press the center button to select each item.

- **Heating Delta T (default stored in control) –** valid range: 4 to 12ºF (in 1ºF increments)
- **Cooling Delta T (default stored in control) –** valid range: 9 to 20ºF (in 1ºF increments)

NOTE 1: Minimum and Maximum degree values are shown only when the control is configured with the appropriate values.

NOTE 2: Refer to section 3.6.3 for multi-unit configuration instructions.

MODULATING VALVE CONFIGURATION	
OFF POSITION	0.0
VALVE CONTROL DELTA T	
HEATING DELTA T	7 F
COOLING DELTA T	10 F
MAXIMUM HEAT LWT	80 F
MINIMUM COOL LWT	40 F
◀ PREVIOUS	SELECT ■

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9.0 Service Mode

SERVICE MODE	
MANUAL OPERATION	
CONTROL DIAGNOSTICS	
DIPSWITCH CONFIG	
FAULT HISTORY	
CLEAR FAULT HISTORY	
SELECT OPTION ▲▼	
◀ PREVIOUS	SELECT ■

9.1 MANUAL OPERATION
Manual Operation mode allows the service personnel to manually command operation for any of the thermostat outputs, blower speed, as well as pump speed or valve position to help troubleshoot specific components.

NOTE 1: The ECM Airflow adjustment will not be present if the connected communicating control (DXM2) is not configured for ECM (section 3.3).

NOTE 2: The Pump Speed adjustment will not be present if the connected communicating control (DXM2) is not configured for Pump (section 3.3).

NOTE 3: The Valve Position adjustment will not be present if the connected communicating control (DXM2) is configured for Valve (section 3.1).

NOTE 4: If multiple units are connected to one thermostat, refer to section 9.6

MANUAL OPERATING MODE			
Y1	COMM	OUTPUT	OFF
Y2	COMM	OUTPUT	OFF
W	COMM	OUTPUT	OFF
O	COMM	OUTPUT	OFF
G	COMM	OUTPUT	OFF
H	COMM	OUTPUT	OFF
DH	COMM	OUTPUT	OFF
ECM	AIRFLOW		0
PUMP	SPEED		0%
TEST	MODE		OFF
SELECT OPTION ▲▼			
◀ PREVIOUS			SELECT ■

9.2 CONTROL DIAGNOSTICS
Control Diagnostics mode allows the service personnel to view the status of all physical inputs, switches, temperature sensor readings, as well as the operational status of the pump at the thermostat.

Navigate between diagnostic screens using the left/right arrow buttons.

NOTE 1: The Pump Status will not be present if the connected communicating control (DXM2) is not configured for Pump (section 3.3).

NOTE 2: If multiple units are connected to one thermostat, refer to section 9.6.

CONTROL DIAGNOSTICS - 1	
LT1 TEMP	38.1
LT2 TEMP	79.9
COMP DISCHARGE	157.7
ENTERING WATER	78.5
LEAVING WATER	73.3
HOT WATER EWT	121.5
LEAVING AIR	75.1
LOOP PUMP SPD	60%
LOOP PUMP WATTS	140
LOOP FLOW GPM	7.4
ECM BLOWER RPM	550
ECM TARGET CFM	800
ECM BLOWER STATIC	0.5
◀ PREVIOUS	NEXT ▶

CONTROL DIAGNOSTICS - 2	
HP SWITCH	CL
LOC SWITCH	CL
Y1 PHYSICAL INPUT	ON
Y2 PHYSICAL INPUT	OFF
W PHYSICAL INPUT	OFF
O PHYSICAL INPUT	ON
G PHYSICAL INPUT	ON
H PHYSICAL INPUT	OFF
EMERG SHUTDOWN	OFF
NIGHT SETBACK	OFF
OVR INPUT	OFF
CONTROL VOLTAGE	26.4
◀ PREVIOUS	

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9.3 DIPSWITCH CONFIGURATION

Dipswitch Configuration mode allows the service personnel to view the status of all dipswitch settings for the connected communicating control (DXM2/AXM) at the thermostat.

Navigate between configuration screens using the left/right arrow buttons.

NOTE 1: The unit control dipswitch settings cannot be changed from the thermostat.

NOTE 2: If multiple units are connected to one thermostat, refer to section 9.6.

```
            CONTROL CONFIGURATION
                DIPSWITCH S1

1   ON   UPS   ENABLED
2   ON   DUAL   COMP   STG   1
3   ON   HEAT   PUMP   TSTAT
4   ON   RV  O   THERMOSTAT
5   ON   DEHUMID   OFF
6   ON   EH2   AUX   HEAT
7   ON   BOILERLESS
8   ON   SEE   DXM2   AOM

◄ PREVIOUS                        NEXT ►
```

```
            CONTROL CONFIGURATION
                DIPSWITCH S2

1   ON \  ACCESSORY 1
2   ON   ACCESSORY 2
3   ON/

4   ON \ ACCESSORY 2
5   ON ACTIVE W/ COMP
6   ON /

7   ON   H   DEHUM   INPUT
8   ON   FACTORY   SETTING
◄ PREVIOUS                        NEXT ►
```

```
            CONTROL CONFIGURATION
                DIPSWITCH S3

1   ON    FACTORY   SETTING
2   OFF   HWG   TEST   OFF
3   OFF   HWG   SP   125
4   OFF   HWG   DISABLED

JW3 LT1 SETTING WELL

◄ PREVIOUS
```

9.4 FAULT HISTORY

Fault History mode displays the five most recent stored fault codes for the connected communicating control (DXM2).

Navigate between control fault codes using the up/down arrow buttons. Press the center button to view more information about the highlighted fault code.

NOTE: If multiple units are connected to one thermostat, refer to section 9.7.

```
          TT038    SN - - - - - 0 1 2 3
               LAST 5 FAULTS

LT1   LOW   WATER   TEMP

NO   FAULT

NO   FAULT

NO   FAULT

NO   FAULT

                                  NEXT ►
◄ PREVIOUS                      SELECT ■
```

```
          FAULT CONDITION MENU

LT1   LOW   WATER   TEMP
HEAT   1   11:11 AM   11/14

FAULT   TEMP   CONDITIONS

FAULT   FLOW   CONDITIONS

FAULT   I/O   CONDITIONS

FAULT CONFIG COND

FAULT POSSIBLE CAUSES
◄ PREVIOUS                      SELECT ■
```

9.4.1 Temperature Conditions

Displays detailed temperature readings that were recorded at the time the fault occurred.

NOTE: If multiple units are connected to one thermostat, refer to section 9.6.

```
       FAULT TEMPERATURE CONDITIONS
          LT1   LOW   WATER   TEMP
HEAT   1   11:11 AM   11/14

LT1    TEMP                       28.1
LT2    TEMP                       97.3
HOT   WATER   EWT                121.5
COMP   DISCHARGE                 157.7
LEAVING AIR                       92.7
LEAVING WATER                     34.9
ENTERING WATER                    42.1
CONTROL VOLTAGE                   26.4

◄ PREVIOUS
```

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9.4.2 Flow Conditions
Displays detailed blower and pump speed / valve position readings that were recorded at the time the fault occurred.

NOTE: If multiple units are connected to one thermostat, refer to section 9.7.

FAULT FLOW CONDITIONS	
LT1 LOW WATER TEMP	
HEAT 1 11:11 AM 11/14	
ECM TARGET CFM	800
ECM BLOWER RPM	550
FLOW RATE GPM	6.5
PUMP SPEED	60%
PUMP WATTS	140
LOOP CONFIG	VS PUMP
◄ PREVIOUS	SINGLE

9.4.3 Input/Output Conditions
Displays the status of all physical and communicated inputs, switches, and control outputs that were recorded at the time the fault occurred.

NOTE: If multiple units are connected to one thermostat, refer to section 9.7.

FAULT I / O CONDITIONS
LT1 LOW WATER TEMP
HEAT 1 11:11 AM 11/14

TSTAT		SAFETY	OUTPT
CONV	COMM	HPS	
Y1	Y1	LOC	CC
Y2	Y2	CO	RV
W	W		ACC1
O	O	OUTPT	ACC2
G	G	FAN	AL1
H	H	HWG	EH1
OVR	DH	PUMP	EH2

◄ PREVIOUS

9.4.4 Configuration Conditions
Displays the status of all dipswitch settings that were recorded at the time the fault occurred.

NOTE: If multiple units are connected to one thermostat, refer to section 9.7.

FAULT CONFG CONDITIONS

LT1 LOW WATER TEMP
HEAT 1 11:11 AM 11/14

	S1		S2		S3
1	ON	1	ON	1	ON
2	ON	2	ON	2	OFF
3	ON	3	ON	3	OFF
4	ON	4	ON	4	OFF
5	ON	5	ON		
6	ON	6	ON	LT1	WELL
7	ON	7	ON	LT2	WELL
8	ON	8	ON		

◄ PREVIOUS

9.4.5 Possible Causes
Possible causes as to why the fault occurred

NOTE: If multiple units are connected to one thermostat, refer to section 9.7.

POSSIBLE FAULT CAUSES
LOW WATER COIL TEMP

LOW WATER TEMP - HTG
LOW WATER FLOW - HTG
LOW REFRIG CHARGE - HTG
INCORRECT LT1 SETTING
BAD LT1 THERMISTOR
◄ PREVIOUS

9.5 CLEAR FAULT HISTORY
Clear Fault History will clear all fault codes stored in the thermostat as well as the fault history in any connected communicating controls (DXM2/AXM).

Notes:

Revision History

Date	Page #	Description
10 March, 2015	Various	Content Updated
3 April, 2014	Various	Content Updated
15 Jan., 2014	36	'Verifying DC Voltage on DXM2 Board for Mod Valve Check' Diagram Corrected
6 Sept., 2013	All	First Printed

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97B0601N01

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Rev.: 10 March, 2015