

## Expansion Valve Troubleshooting



### General

This Technical Note is to help in troubleshooting Thermal Expansion (TX) valve problems. Such problems are typically indicated by lower than normal suction pressure, valve hunting and/or cycling on the anti-frost switch. Prior to replacing a TX Valve the steps given in this Tech Note should be followed. The TX valves used in the Unico Blower Coils are very reliable refrigeration metering devices. They are, however, susceptible to trouble when questionable brazing and/or evacuation practices are utilized. Experience has shown that most TX valves are needlessly replaced. The number of faulty valves has been a very low percentage of the of the *Unico Systems* installed.

In order for Unico, Inc. to honor the product warranty for replacement of a TX Valve it is requested that the *Bulletin 30-100, Service Report* be filled out and sent or faxed to the Unico, Inc. Office to secure authorization for the replacement of the TX Valve. This form provides space to record important information; much of which is discussed in this Tech Note.

In some cases before approving the replacement of the TX Valve, the Unico, Inc. Service Department may request that a Factory Technical Representative for the TX Valve manufacturer be allowed to visit the job site to diagnose the TX valve problem and approve the replacement if warranted.

### STEPS TO TAKE BEFORE REPLACING TX VALVE:

#### DISTRIBUTION SYSTEM INVESTIGATION:

- 1.) Check the airflow of the system using the TurboMeter to measure each outlet. Page 2 of the *Service Report, Bulletin 30-100*, provides a convenient form to record room by room outlet readings. It also describes how to take the measurements. Add up the airflow from all outlets to obtain the total system airflow.
- 2.) Measure the volts and amps of the Indoor blower Motor and check the Table (Chart) shipped with each unit. If the chart is not available at the job site, check model number of the blower motor and request a chart from the factory for the specific blower coil model and motor model numbers.
- 3.) Compare the airflow from the chart to the total measured with the TurboMeter. If the chart indicates an airflow more than 10% greater than the outlets, there is a high possibility the system has air leaks. Check all plenum and duct con-

Nominal Tonnage	Model	Typical Design CFM	Minimum CFM	Minimum Full Outlets
1	M1218	250	200	5
1 1/2		300		
2	M2436	400	300	8
2 1/2		450		
3	M4260	550	400	10
3 1/2		600		
4	M4260	700	500	13
5		800		
		900	600	15
		1000	700	18
			800	20
			1000	25

Table 1. Minimum cfm per ton

- nections for air leakage. Seal all leaks and re-measure airflow.
- 4.) Once the airflow is within 10% of each other use the value from the Chart and compare the measured airflow to the design airflow for the installation. The typical and minimum airflow for various size systems is shown in Table 1.
  - 5.) It never hurts and always helps if the system is operated at a greater airflow than the design values shown in Table 1 provided none of the outlets deliver become noisy because of too much airflow. Extra outlets may be necessary to get the proper airflow and to reduce the noise level, especially for long runs or runs with an orifice.
  - 6.) If the proper number of full outlets have been used but the airflow is still below the minimum of Table 1 then check Table 2 for possible solutions to the problem.
  - 7.) If the plenum system is relatively long and has many fittings, it can be helpful to locate high-pressure drop sections by measuring the External Static Pressure (ESP) at various locations along the plenum. High ESP readings and resultant lower air flows will cause lower than normal suction pressures. First measure 18" or more from the blower coil unit. This reading should be between 1.0 and 1.8 IWC and ideally about 1.5 IWC at this point and after the electric duct heater, if installed. High ESP can cause the condensing unit to cycle on the anti-frost switch. Check the ESP near the end of the plenum (18" upstream from the end cap). A significant pressure drop (0.75 IWC or more) will normally indicate that an obstruction exists in the plenum system. Work back towards the blower coil taking ESP readings until it is found where the high-pressure drop exists.
  - 8.) ESP readings can be measured with a gauge capable of achieving at least 3 IWC. A U-tube Gas Pressure Manometer or Inclined Gauge type Manometer can be used. When taking ESP measurements penetrate the plenum wall so that the tip of the measuring tube is just flush with the inside surface of the plenum; do not let the tip of measuring project into the air stream or faulty readings will result.

Once all checks of the Distribution System have been exhausted then look at the refrigeration system.

What to Check	Instructions	Reference Literature
Check the Return Air System to ensure it is properly sized and unobstructed	Total pressure drop of the Return Air System should not exceed 0.15 IWC (inches of water column). Measure with inclined manometer. Check for collapsed return air bag or inadequately sized return if a field fabricated return is used.	Tech Note 106, Return Duct Design Requirements
Ensure the filter is clean and properly sized	Certain filters can not be used with the <i>Unico System</i> since they inherently have an excessive pressure drop. The filter pressure drop should not exceed 0.10 IWC. To check if the filter you are using is compliant with the <i>Unico System</i> see Reference Literature.	Tech Note 118, Air Cleaning Devices for the Unico System
Ensure the layout of the system is compliant with the Application standards.	Assure that a minimum of 24-inches is maintained between the blower outlet and the first plenum fitting or accessory device such as an Electric Duct Heater.	Bulletin 40-20, Application Instructions-Component Layout
Determine the first plenum fitting after the air handler	An elbow as the first plenum fitting after the air handler can impose a high pressure drop, hence a tee is always recommended as the first plenum fitting whenever possible. When the elbow is used as first fitting, it may need to be increased from 7-inch to 9-inch if round plenum is being used.	Bulletin 40-20, Application Instructions-Component Layout
Duct run length and minimum bend radius	If the run is not orificed and length around 10-15 feet the cfm should be about 35-40. The radius of bends in the supply tubing should be a minimum of 6-inches.	
Outlet does not have the proper airflow	If the airflow at the outlet is significantly lower than expected, check to see if the duct has not been crushed, collapsed or otherwise obstructed.	
Check the type of main plenum layout	The main plenum should be run as to keep the supply duct runs as short as possible. The perimeter loop system is one way to keep the 2-inch runs shorter.	

**Table 2. System Checks**

**REFRIGERATION SYSTEM INVESTIGATION:**

**Step 1: Verify Proper Line Size**

Assure that properly sized refrigerant lines have been installed. Modular Blower Coil Units, models M2436 and M4260, are equipped with 7/8-inch (22.2 mm) suction line and 3/8-inch (9.5 mm) liquid line connections. The M1218 models have 5/8-inch (15.9 mm) suction lines and 3/8-inch (9.5 mm) liquid line connections. If the condensing unit is stubbed differently, the reducer/increaser should be installed at the blower coil unit as opposed to the outdoor section.

**Step 2: Verify Proper Ambient Condition**

When system is operated with low outdoor ambient temperatures (e.g. below 80°F) the suction pressure will be lower and it is more difficult to diagnose a TX Valve problem. In such situations, it is helpful to block off condenser airflow and observe what happens to both suction and discharge pressures. Both pressures should rise. If the suction pressure does not increase this indicates the TX Valve is not responding and may be contaminated or the system charge is suspect.

**Step 3: Verify Proper Charge**

Be sure the system has been properly charged. *Unico Systems* are normally charged by the “Sub-cooling” method in the cooling mode. Note that charge should not be established when outdoor temperature is below 65°F and preferably should be 75°F or higher. Where a condensing unit manufacturer indicates a different method for establishing charge this may be followed, especially for the higher SEER units, if it does not involve a fixed amount of charge for a given size. When in doubt, check with Unico, Inc. Service Department. Sub-cooling should be between 3-8°F (2-4°C), and no more than 15°F (8°C).

**Step 4: Verify Liquid Column**

Unico highly recommends that a filter-drier and sightglass be installed at the evaporator, with the sightglass downstream from the filter-drier. Check the sight glass for bub-

bles, which can degrade the performance of the valve and cause a high superheat.

It is also possible for a hot attic to heat the liquid line enough to create bubbles, particularly if the evaporator is significantly higher than the condenser. If this is suspected you should insulate the liquid line and charge the system to the high end of the range in Step 3.

**Step 5: Check Superheat**

Superheat should be in the range of 12 to 20°F (6 to 11°C), no more than 25°F (14°C). Superheat in the normal range indicates the valve is probably working properly, but further investigation should be made.

**Step 6: Verify TX Valve Operation**

Remove the TX Valve bulb from the suction line in the Blower Coil cabinet. With the system running, place the bulb in your hand. The check will require two people if the gauge connections are located at the outdoor unit. When the bulb is warmed, suction pressure should rise and superheat should fall. Then place the bulb into ice water. The suction pressure should fall and the superheat should rise. If no change is evident, the valve is most likely contaminated and should be cleaned.

**CAUTION**

**To prevent compressor damage, do not operate the system with the bulb removed or warmed for an extended period.**

**General**

In almost all cases, the problem can be corrected by clearing the valve of any debris, see *Tech Note 108, Thermal Expansion Valve Clean Out Procedure*.

Once all of the above checks have been made and problems persist with the TX Valve, contact the Unico Service Department. Be sure to execute the *Bulletin 30-100, Service Report* and send or fax to Unico, Inc.