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ORDERING NO. **TOL-OM-2**

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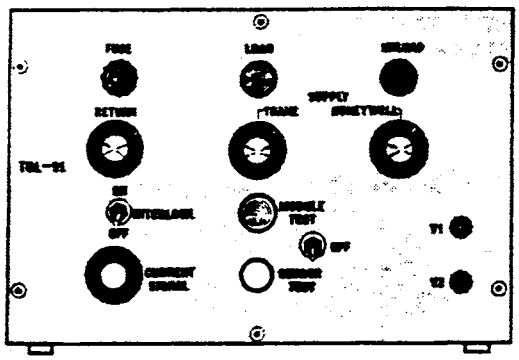

TOL-91

TRANE AGM AND HONEYWELL 901-D CAPACITY CONTROL MODULE TESTER

FOR USE WITH MODEL CVHE, CVHB AND CVAC CENTRIFUGAL CHILLERS

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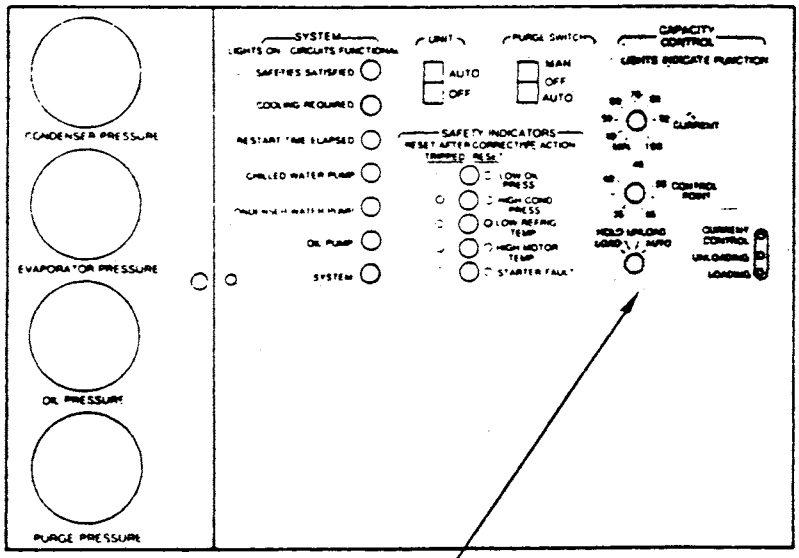
TO HELP ENSURE OPTIMUM PERFORMANCE, BE SURE TO SPECIFY QUALITY TRANE PARTS.

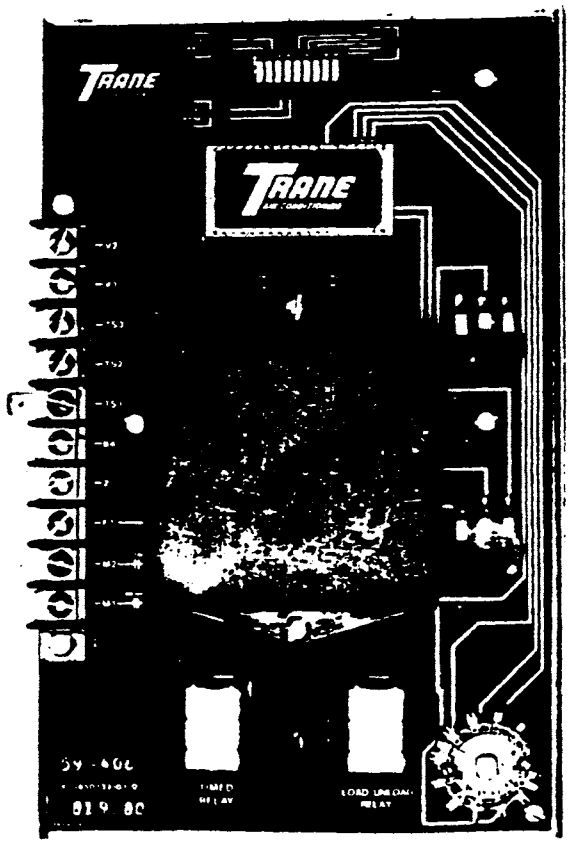
INTRODUCTION

This manual explains how to properly use TOL-91 to check the operating condition of the Trane AGM or Honeywell 901-D capacity control module in the field or at the shop. Be sure to follow these instructions carefully to ensure an accurate diagnosis of the control module's condition, and to avoid damaging either the module or the tester. Illustrations of the AGM capacity control module and TOL-91 are provided in Figures 1 and 2.

NOTE: While the copy and illustrations in this manual relate specifically to the AGM capacity control module used on CVHE and CVHB units, the same test procedure can be used to test the Honeywell 901-D module used on CVAC units. Any differences between the test procedures for these two types of modules are explained in the instructions.



CONTROL PANEL SIDE



BACK OF CONTROL MODULE

FIGURE 1 - Trane AGM Electronic Capacity Control Module (CVHE/CVHB Units)

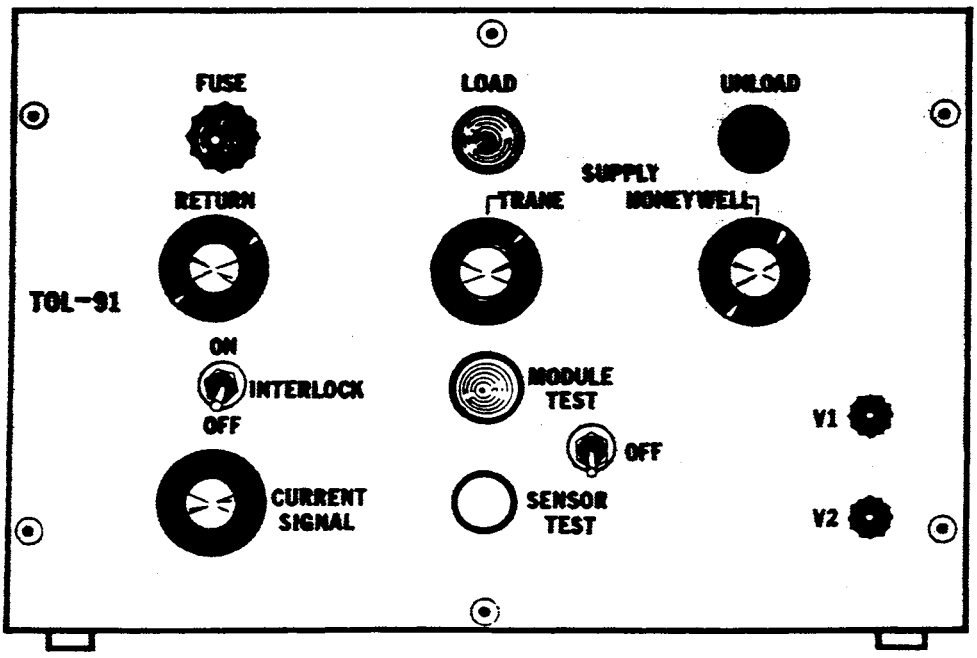


FIGURE 2 - TOL-91 (Capacity Control Module Tester)

SETUP FOR CAPACITY CONTROL MODULE CHECKOUT

WARNING: OPEN AND LOCK UNIT DISCONNECT TO PREVENT INJURY OR DEATH DUE TO ELECTRICAL SHOCK OR CONTACT WITH MOVING PARTS.

NOTE: Whenever TOL-91 is used to test capacity control modules in the field, be sure to disconnect **all** electrical wiring to the module before connecting the control module tester.

Connect the leads of the TOL-91 wiring harness to the proper terminals on the capacity control module. Notice that the terminal designations on the Trane AGM and Honeywell 901-D capacity control modules are different; the connection arrangement on each module is shown in Table 1.

TABLE 1 - Capacity Control Module Connection Arrangements

AGM CAPACITY CONTROL MODULE	HONEYWELL 901-D CAPACITY CONTROL MODULE
V2	R1
V1	R2
TS3	X2
TS2	XX1
TS1	M1
84	M2
2	V2
F1	V1
M2	TS1
M1	HTS2

To accomodate the differences in terminal designations, each of the TOL-91 wiring harness leads is marked with dual terminal identification numbers. These numbers represent the corresponding terminals on the AGM and Honeywell 901-D control modules. Once the harness is attached to the control module, **doublecheck each connection to ensure that TOL-91 is properly wired.**

NOTE: The TOL-91 wiring harness does not contain a wire for Terminal R2 of the Honeywell 901-D capacity control module since Terminals R2 and X2 are jumpered together.

TOL-91 Setup

Adjust the TOL-91 controls to the positions described below; refer to Figure 2 for the locations of these controls.

1. Current Signal Knob = Twelve O'Clock Position
2. Supply Knobs = Twelve O'Clock Position
3. Return Knob = Twelve O'Clock Position
4. Interlock Switch = ON Position
5. Module/Sensor Test = OFF Position

To read DC voltage signals for each of the test positions in this checkout procedure, adjust a digital voltmeter to the low DC voltage scale and attach the meter leads to Terminal Posts V1 and V2 on TOL-91.

Trane Capacity Control Module Setup (AGM)

1. Check the position of the dip switches located on the back of the control module. At least one of the dip switches of each component program (i.e., reset ratio, deadband, and load delay) should be positioned at ON. (The back of the control module is illustrated in Figure 3.)

   Use of these dip switches will enable the operator to check deadband, reset and load delay time. (Additional selections may be made, provided that all three of these functions--deadband, reset and load delay--are in the test circuit. Dip switch positions for alternate functions may be found in the CVHE Service Guide (HCTV-SG-2), Section 7.12.)

2. Before beginning any of the test procedures described in the following section, set the current limit control (labelled % CURRENT) on the Trane capacity control module to 100 percent. Then, adjust the module/sensor test switch on the TOL-91 to the MODULE TEST position.

3. Increase the current signal from TOL-91 until the amber current control light on the unit control panel illuminates. At this point, the digital voltmeter should register 8.25 VDC.

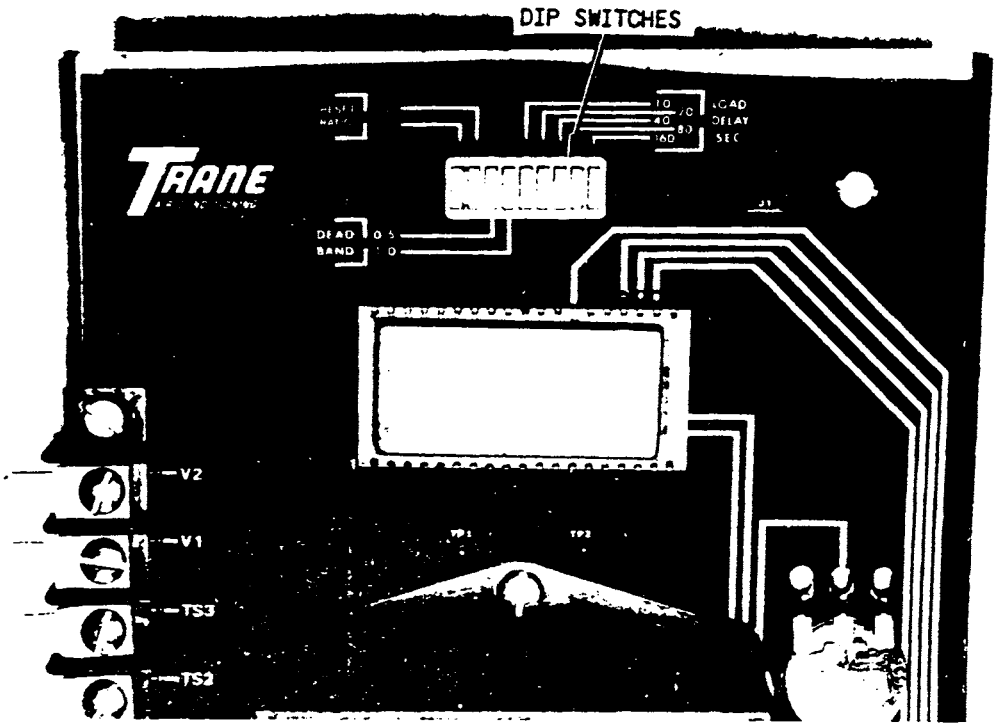


FIGURE 3 - Dip Switches (Back of Trane AGM Capacity Control Module)

CAPACITY CONTROL MODULE CHECKOUT PROCEDURE

To initiate the control module checkout procedure, a load signal must be sent to the capacity control module. To accomplish this on either a Trane AGM or Honeywell 901-D module, adjust the module/sensor test switch (on the TOL-91) to the MODULE TEST position. Then, rotate the load supply knob to the right of the twelve o'clock position.

NOTE: When testing the Trane AGM capacity control module, any of the adjustments made with the supply or return knobs of TOL-91 will be followed by a four to six-second pause to allow for the simulated temperature signal change.

NOTE: Be sure to adjust the Honeywell 901-D capacity control module to current limit at 8.25 VDC when functioning at full load. In addition, the temperature control knob must be positioned at 45 degrees.

1. Load Limit

Adjust the % CURRENT knob on the control module to 80 percent; then increase the current signal on TOL-91 until the amber current control light on the control panel illuminates. This light indicates that the current limit has been reached.

NOTE: On Honeywell 901-D control modules only, any increase in current beyond the current limit setpoint will result in a continuous unload signal.

2. **Load Limit and Unload 103 Percent (Trane AGM Control Modules Only)**

Once the load limit is established (Step 1), slowly rotate the TOL-91 current signal knob until the pulsing, red UNLOAD light (on TOL-91) illuminates; this indicates an "over current" of 103 percent. (At this time, a constant red UNLOAD light also illuminates on the control module.)

If functioning properly, the capacity control module should emit unload pulses at 0.25-second intervals until the chiller load is reduced to 100 percent.

3. **Load Limit and Unload 105 Percent (Trane AGM Control Modules Only)**

Continue to rotate the TOL-91 signal knob until the UNLOAD lights on the TOL-91 and the control module indicate a continuous unload signal to a current level of 95 percent.

4. **Temperature Control**

a. Readjust the current signal knob on TOL-91 to produce a load (i.e., green) signal on the capacity control module.

b. Position the temperature control knob on the control module to the 45-degree setting.

c. Slowly rotate the TOL-91 supply knob (i.e., "Trane" when testing the Trane AGM capacity control module, or "Honeywell" when testing the Honeywell 901-D capacity control module) to the left until an unload (i.e., red) signal is displayed both on the capacity control module and the TOL-91.

With finer adjustment of the TOL-91 supply knob, a deadband or null condition can be obtained.

5. **Interlock**

Turn the TOL-91 interlock from ON to OFF. Notice that an immediate and continuous unload (i.e., red) signal appears on the Trane AGM capacity control module, while a current limit with a continuous unload (i.e., red) signal appears on the Honeywell 901-D capacity control module.

This signal indicates either that the inlet vanes are closing because of a low refrigerant temperature, or that the starter is being de-energized.

Return the interlock switch to the ON position before proceeding to Step 6.

6. **Function Switch**

Rotate the function switch on the capacity control module and note the action of the mode indicator lights. When the function switch is positioned at:

a. LOAD, the green indicator light should illuminate.

b. HOLD, none of the indicator lights should illuminate.

c. UNLOAD, the red indicator light should illuminate.

d. AUTO, the mode signal will respond to the simulated chilled water or current input signal.

7. **Load Limit in Any Function**

With the % CURRENT knob on the control module still set at 80 percent, adjust the control module function switch to any function position. Then, increase the current signal from TOL-91 and verify that the current limit and unload (i.e., red) indicator lights illuminate.

8. **Reset (Trane AGM Capacity Control Module Only)**

Set the temperature control knob on the capacity control module at 45 degrees, and adjust the TOL-91 "Trane" supply knob until a deadband or null condition exists. Then, simulate a decrease in return water temperature by turning the TOL-91 return signal knob to the left; the UNLOAD (i.e., red) light should illuminate.

Illumination of the UNLOAD light indicates automatic reset when the return water falls within the prescribed range of the reset sensor (i.e., as determined by the setting of the control point knob on the capacity control module).

Readjust the TOL-91 return knob to its original position before proceeding to Step 9.

9. **Sensor Test (Trane AGM Capacity Control Module Only)**

NOTE: A digital volt-ohmmeter (VOM) and jumper wire are required to conduct this test.

a. Adjust TOL-91 to the sensor test mode.

b. Connect the sensor and VOM in series using the two leads (with alligator clips) provided on TOL-91. See Figure 4.

c. Set the VOM for DC voltage and the low microamp (2 ma) range.

d. Convert the reading obtained from the VOM to water temperature using the data provided in Table 2.

NOTE: Readings from the VOM are equivalent to the Kelvin temperature scale.

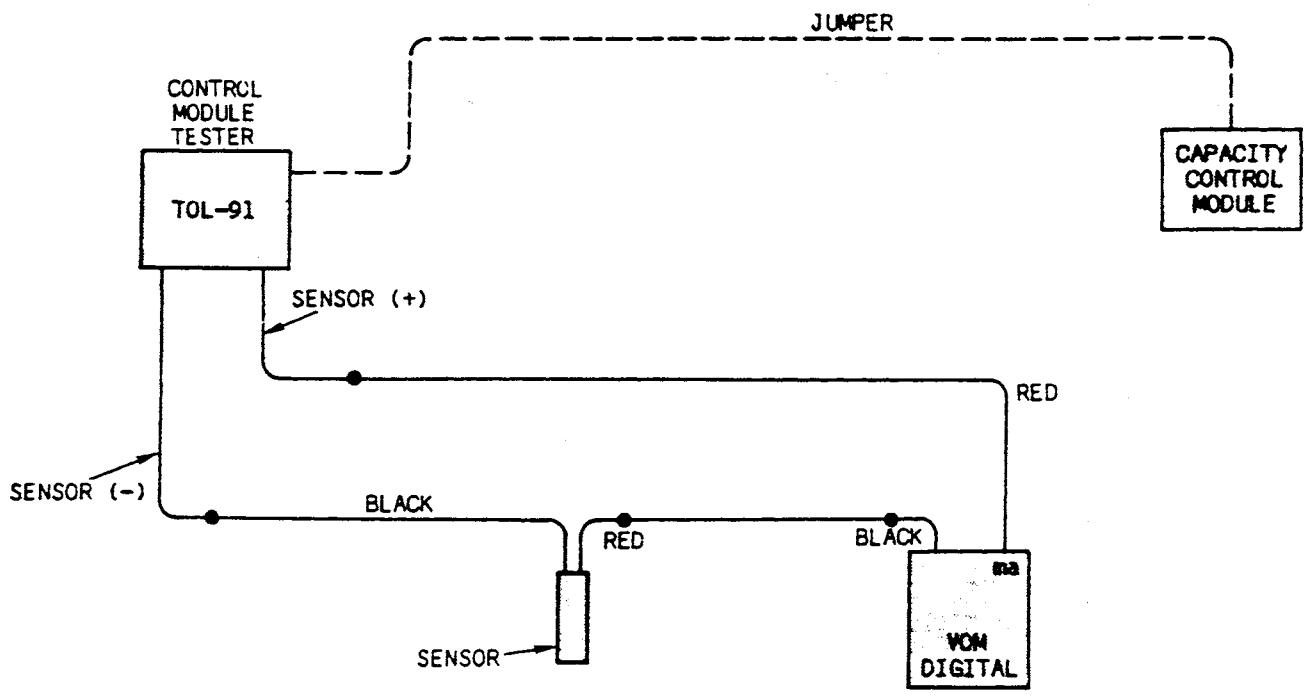


FIGURE 4 - Hookup Schematic for Sensor Test (AGM Capacity Control Module)

TABLE 2 - Temperature Conversion Chart

DEGREES FAHRENHEIT (F)	DEGREES CELSIUS (C)	DEGREES KELVIN (K)*	DEGREES FAHRENHEIT (F)	DEGREES CELSIUS (C)	DEGREES KELVIN (K)*
32	0.00	273.20	57	13.87	287.07
33	0.55	273.57	58	14.43	287.63
34	1.11	274.31	59	14.98	288.18
35	1.66	274.86	60	15.54	288.74
36	2.22	275.42	61	16.00	289.29
37	2.77	275.97	62	16.65	289.85
38	3.23	276.53	63	17.20	290.40
39	3.88	277.08	64	17.76	290.96
40	4.44	277.64	65	18.31	291.51
41	5.00	278.20	66	18.87	292.07
42	5.56	278.75	67	19.42	292.62
43	6.11	279.31	68	19.98	293.18
44	6.67	279.86	69	20.53	293.73
45	7.22	280.42	70	21.09	294.29
46	7.78	280.97	71	21.64	294.84
47	8.33	281.53	72	22.20	295.40
48	8.89	282.08	73	22.75	295.95
49	9.44	282.64	74	23.31	296.51
50	10.00	283.20	75	23.86	297.06
51	10.56	283.75	76	24.42	297.62
52	11.11	284.31	77	24.97	298.17
53	11.67	284.60	78	25.53	298.73
54	12.22	285.42	79	26.08	299.28
55	12.78	285.97	80	26.64	299.84
56	13.32	286.52			

*Degrees Kelvin = Microamps

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