



APPLICATION NOTE

APP #157

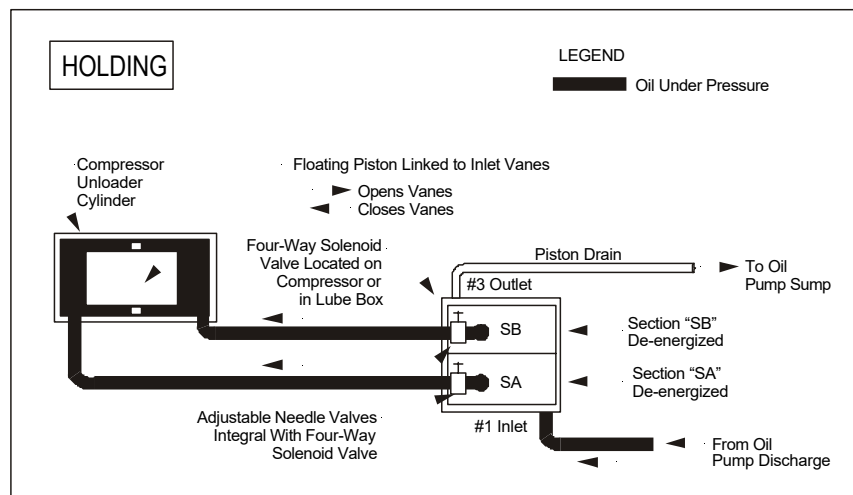
VFD McQuay/Daikin Centrifugal Virtual Vane Sensor Calibration

MCS Firmware Ver. 17.22-B Cent Mag or later
MCS-CONNECT - Ver. 18.40 or later

Vane Operation

The hydraulic system for the vane control operation consists of a 4-way normally open solenoid valve. Oil under pressure is directed by the 4-way valve to either or both sides of the piston depending on whether the control signal is to load, unload or hold.

To open the vanes (or load the compressor) solenoid "SA" is de-energized and solenoid "SB" is energized, allowing oil flow from port SA to one side of the piston and allow oil from the other side of the piston to drain through port SB.



The valves are normally factory set so the vanes will move from fully closed to fully opened in approximately 3 minutes and from fully open to fully closed in 1 minute (except CE126). The speed should be slow enough to prevent over-controlling and hunting.

The vane speed is factory set and varies by compressor size:

| Compressor Model | Opening Time | Closing Time |
|------------------|----------------|--------------|
| CE048 - CE050 | 2 - 2 1/2 min. | 3/4 - 1 min. |
| CE063 - CE100 | 3 - 5 min. | 1 - 2 min |
| CE126 | 5 - 8 min. | 1 - 2 min. |



**MCS-Magnum controller must be completely wired.
Run/SW sensor input in "OFF" POSITION AND CHILLER STOPPED.**

**This procedure will walk you through the steps needed for
showing the vane position - Fully Opened or Fully Closed**

1. Start MCS-CONNECT - Connect via Serial, Ethernet, or Remote
2. Click on the tab to load into the controller you need to calibrate the vanes for.
3. Get authorized by clicking on the red "View Only" button and inputting your password.
4. Click on the 'View' button at the top of Connect. Open the Relay Outputs and Sensor Inputs windows and locate the 'Open Vane' and 'Close Vane' relay outputs and inputs.
5. **CLICK ON 'Reset/Clear', clear 'Reset Lockouts'. ALL LOCKOUTS MUST BE CLEARED**

RELAYS AND SENSORS USED FOR THIS SETUP MUST BE IN 'AUTO'

| RO # | Relay Outputs | Value | Manual Status | Last On |
|------|---------------|-------|---------------|----------|
| M-1 | Comp Enbl | OFF | AUTO | 00:00:00 |
| M-2 | SpareRM-2 | OFF | AUTO | 00:00:00 |
| M-3 | Open Vane | OFF | AUTO | 12:20:01 |
| M-4 | Close Vane | OFF | AUTO | 12:21:53 |

| SI # | Sensor Inputs | Value | Manual Status | Filter |
|------|---------------|--------|---------------|---------|
| M-12 | Vane % | 101.0% | AUTO | 0 / 0.0 |
| M-13 | VaneClosed | NO | AUTO | 0 / 0 |
| M-14 | VaneOpen | NO | AUTO | 0 / 0 |



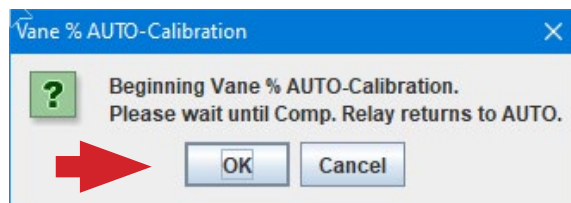
**STEP#1 TURN THE OIL
PUMP RELAY TO 'MANON'**

| RO # | Relay Outputs | Value | Manual Status |
|------|---------------|-------|---------------|
| M-3 | Open Vane | OFF | AUTO |
| M-4 | Close Vane | OFF | AUTO |
| M-5 | Oil Pump | ON | MANON |

6. Click on row for Relay Output 'CompEnbl', under Manual Status cell, choose 'VaneCal' from the drop down window.

| RO # | Relay Outputs | Value | Manual Status | Last On | Last Off | Run Today | Cycles Today | Run Ydy | Cycles Ydy | Total Run Hrs | Total Cycles |
|------|---------------|-------|---------------|---------|----------|-----------|--------------|----------|------------|---------------|--------------|
| M-1 | Comp Enbl | OFF | Van... | 0:00 | 16:19:46 | 00:00:00 | 0 | 00:00:00 | 0 | 0.00 | 0 |
| M-2 | SpareRM-2 | OFF | | 0:00 | 16:19:46 | 00:00:00 | 0 | 00:00:00 | 0 | 0.00 | 0 |
| M-3 | Open Vane | OFF | | 7:27 | 16:38:53 | 00:01:26 | 1 | 00:00:00 | 0 | 0.02 | 1 |
| M-4 | Close Vane | ON | | 8:54 | 16:19:46 | 00:22:37 | 1 | 00:00:00 | 0 | 0.38 | 1 |

7. Popup screen, click on OK to begin 'VaneCal'.



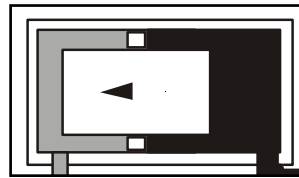
When you click on 'VaneCal', the System Status screen under 'State' will change to:

a) CLOSING VANES

The unit is pulsing the piston to the close state as shown on right. Piston fully closed, making contact with switch and sensor, 'VaneClosed' will change to 'YES'

| System Status | |
|------------------------|----------|
| Capacity Control State | Time |
| RUN/STOP SW OFF | 24:37:45 |
| State | Time |
| 1)CLOSING VANES | 00:00:13 |

| Sensor Inputs | | | |
|---------------|---------------|----------|--|
| Basic | | Advanced | |
| SI # | Sensor Inputs | Value | |
| M-12 | Vane % | 1.0% | |
| M-13 | VaneClosed | YES | |
| M-14 | VaneOpen | NO | |



Piston fully Closed Position

The piston will move from the closed position and will begin pulsing to the open position.

System status state will show:

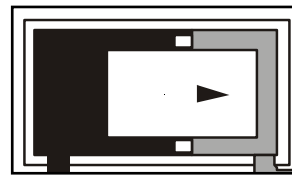
b) TimingVaneOpn

Sensor will then show:

VaneOpen 'YES'

| System Status | |
|------------------------|----------|
| Capacity Control State | Time |
| RUN/STOP SW OFF | 02:13:11 |
| State | Time |
| 1)TimingVaneOpn | 00:00:37 |

| Sensor Inputs | | | |
|---------------|---------------|----------|--|
| Basic | | Advanced | |
| SI # | Sensor Inputs | Value | |
| M-11 | OilSumpTmp | 57.8C | |
| M-12 | Vane % | 101.0% | |
| M-13 | VaneClosed | NO | |
| M-14 | VaneOpen | YES | |

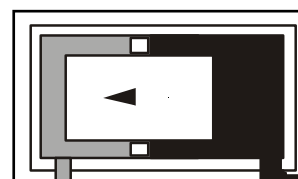


Piston fully Opened Position

Once the vane is completely opened, then the state of the vane will change to:

c)TimingVaneCls

| System Status | |
|------------------------|----------|
| Capacity Control State | Time |
| RUN/STOP SW OFF | 02:14:42 |
| State | Time |
| 1)TimingVaneCls | 00:00:15 |



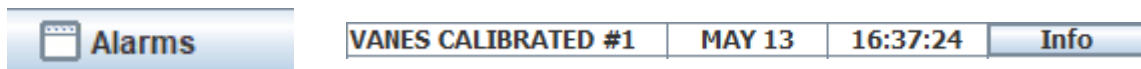
Piston fully Closed Position

When the vane reaches the closed position, the 'CompEnbl' relay value will change to 'AUTO'.

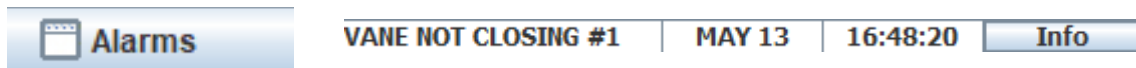
| Relay Outputs | | | | | | | | | | | | |
|---------------|---------------|----------|---------------|----------|----------|-----------|--------------|----------|------------|---------------|--------------|--|
| Basic | | Advanced | | | | | | | | | | |
| RO # | Relay Outputs | Value | Manual Status | Last On | Last Off | Run Today | Cycles Today | Run Ydy | Cycles Ydy | Total Run Hrs | Total Cycles | |
| M-1 | Comp Enbl | OFF | AUTO | 00:00:00 | 15:46:36 | 00:00:00 | 0 | 00:00:00 | 0 | 0.00 | 0 | |
| M-2 | SpareRM-2 | OFF | AUTO | 00:00:00 | 15:46:36 | 00:00:00 | 0 | 00:00:00 | 0 | 0.00 | 0 | |
| M-3 | Open Vane | OFF | AUTO | 15:47:55 | 15:47:56 | 00:00:16 | 16 | 00:00:00 | 0 | 0.00 | 16 | |
| M-4 | Close Vane | OFF | AUTO | 15:48:34 | 15:48:35 | 00:00:29 | 14 | 00:00:00 | 0 | 0.01 | 14 | |
| M-5 | Oil Pump | OFF | AUTO | 15:46:52 | 15:48:36 | 00:01:44 | 1 | 00:00:00 | 0 | 0.03 | 1 | |

NOTE: WHEN VANES ARE FINISHED CALIBRATING, CLICK ON ALARMS WINDOW:

Alarms will show date and time calibrated



IF FAILED, ALARMS WILL SHOW:



OIL PUMP MUST BE SET TO AUTO AFTER CALIBRATION

NOTES

1. If the oil pump runs to long during the process the oil pump may start to cavitate due low oil level.
2. Stop the oil pump, check the level and fill to the proper recommendation of the chiller if needed.
3. If vane calibration is taking more than 5-10 minutes to complete the 'OPEN' process and more than 5-10 minutes to completely closing of the vanes, than setpoint adjustments should be made first to speed up the opening/closing speed.
4. Setpoints used, 37, 38, 56. Setpoints 37, 38 are set in tenths of a second.
5. After adjusting setpoints, run calibration again.

Any questions regarding this release, contact: support@mcscontrols.com

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