IS-IBC1 Blower Drive Checkout – 32 Bit

Introduction

This document covers troubleshooting of the interface between the 32 bit version of the ISIBC1 non-contact internal bubble cooling control system and the variable speed drives that operate the inlet and outlet blowers. This document assumes the equipment is already installed. If you have the 8 bit version of the controller, please refer to IS-IBC1 Blower Drive Checkout – 8 bit.

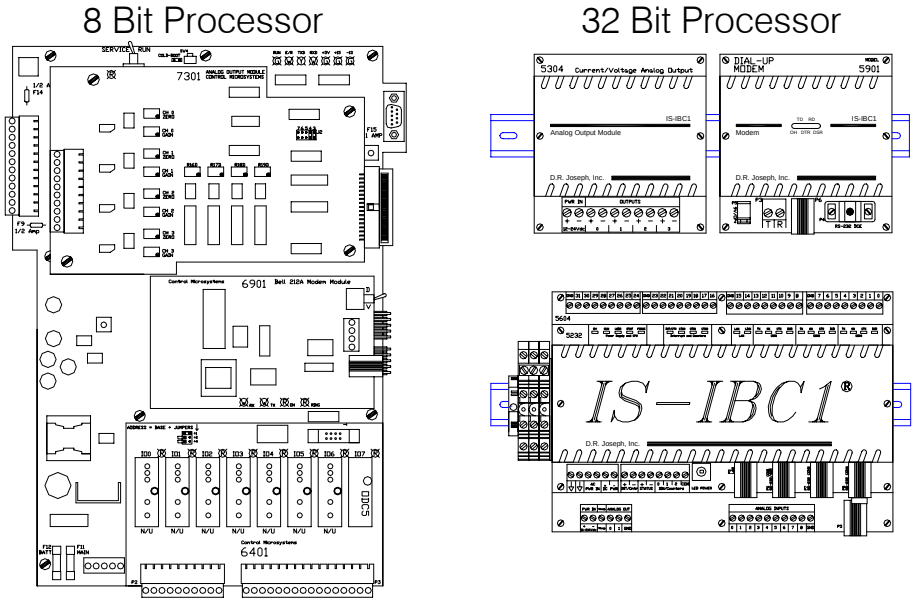

Figure 1 - 8 Bit versus 32 Bit Controller

Background

The IBC system uses a simple interface system to communicate with the IBC blower drives. The interface is designed this way so that connection with nearly any variable frequency drive is possible without the use of custom designed interfaces and protocols. The IBC system uses state management and speed forecast systems to keep track of what speeds the blowers are running. This eliminates the need for costly speed feedback signals. In order for the interface to function properly it is important that the interface wiring is correct and the frequency drives are programmed

correctly. The following describes testing procedures that will help you determine if the variable speed drives are working properly under all possible circumstances. Please review the entire document before proceeding with the tests.

Proper Wiring

The wiring of the IBC system to the variable frequency drives (VFD) is done through the supplied cabling from D. R. Joseph, Inc. Refer to the documentation provided with the system for proper wiring information.

Basic Trouble Shooting

Inlet Blower Will Not Start

Since the IBC system controls the analog signal reference to the inlet drive, verify there is no reference signal to the drive. If there is a signal, the problem is within the drive. If there is no signal, verify reference voltage at the MSR potentiometer. A signal at the MSR but not at the drive indicates the state interface between the inlet drive and the IBC system may not be working.

Inlet Blower Will Not Ramp When Outlet is Started

If outlet blower does not start or if the inlet blower does not begin to increase in speed, check the outlet blower health contact (see figure 2 for a quick test). If the contact is always on, the inlet blower will not begin the second ramp and the bubble will not inflate. Replace the outlet blower interlock contact.

Outlet Blower Will Not Start

Verify the operation of the inlet blower health test (see figure 1). If inlet health is working properly, check the operation of the outlet blower lockout module (see figure 2).

Drive Programming

Regardless of the type of VFD that is installed, the VFD must be a digital device to function properly. In other words, the VFD must be programmable using a digital interface. Older VFDs that use variable resistors to set parameters are not compatible with the IS-IBC1 system. For the proper interface the VFDs must have the stopping method set for "COAST TO STOP." It is also necessary for

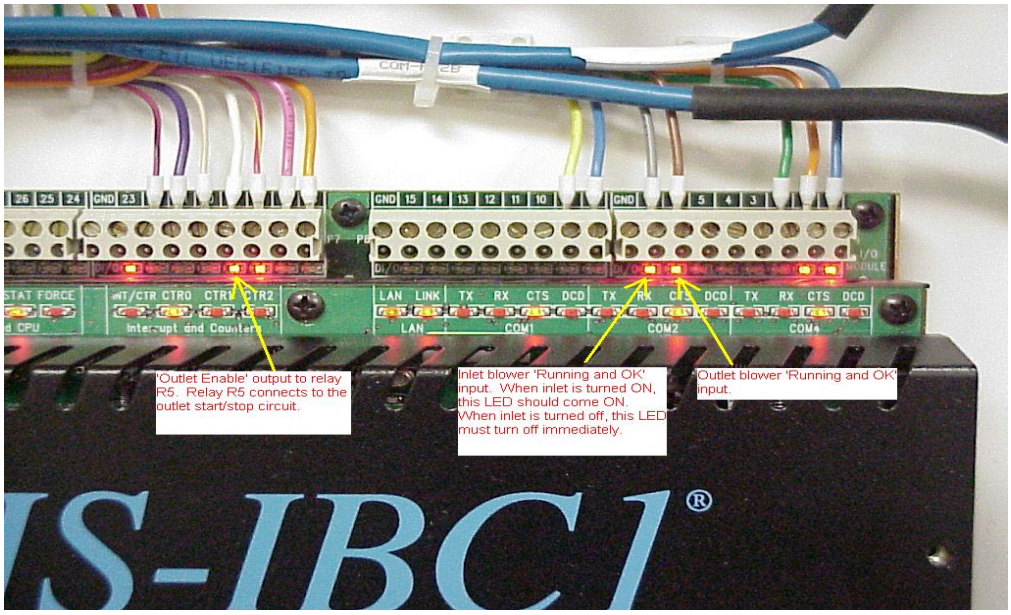

Figure 2 - Testing for Proper Operation of Inlet Blower Controls

the ramp method, or S-curve to be set for "LINEAR." Health contacts should be configured to provide a closed contact when the VFD is running (blower motor turning) and there is no fault. If the operator stops the VFD or if there is power loss or if there is a VFD fault, the contact must open immediately.

Testing the State Interface

The following is the procedure for testing the operation of the VFD interface. All checks must succeed for the IBC system to operate properly. Before starting, verify that power to the IBC system and both VFDs is on. Also make sure the VFDs are setup for remote control.

1. Turn both the inlet and outlet blower off. Both speed displays should indicate 00.0 percent. Now set the Master Speed Reference MSR potentiometer to mid-scale (50 percent).

2. Turn on the inlet blower; the speed display should immediately begin to increase from 00.0 percent to approximately 25 percent. Note, that factory settings will provide one-half of the MSR indication upon startup of the inlet blower, if factory settings have been changed; the 25% value will be different.

3. Turn off the inlet blower, for nearly all VFDs the speed display will immediately drop to zero. If the speed display does not immediately drop to 0, you have to open the main controller and visually check the status of the health contact. See figure 3.

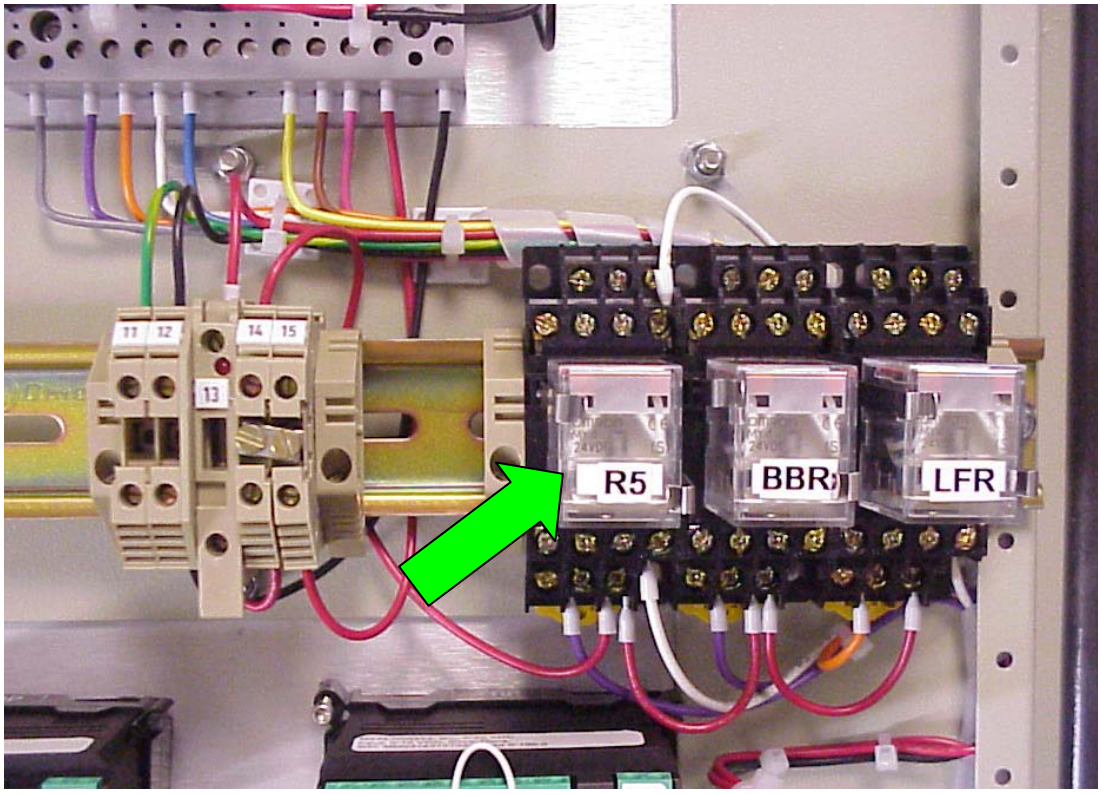

Figure 3 - Outlet Blower Enable Relay

If the inlet health LED does not turn off until after the inlet has finished ramping down to zero speed, the VFD must be reprogrammed for "COAST TO STOP" operation. Consult the programming manual for the specific VFD for instructions on how to do this.

4. Turn ON the outlet blower. The blower should not start. If the outlet blower starts, check the operation of relay R5. On combined systems, relay R5 is mounted in the door of the enclosure. (See below.) On oem systems, this relay is mounted on a terminal strip in the controls enclosure.

The 'Outlet Enable' output form terminal P7-19 (shown in Figure 2) turns on R5 when the inlet blower is running.

5. Turn on the inlet blower and wait until speed has reached a steady value.

6. Turn on the outlet blower. It should begin to increase in speed until it gets close to the speed of the inlet blower, then the inlet blower should begin to increase in speed. *[If outlet blower does not start or if the inlet blower does not begin to increase in speed, check the outlet blower health contact. If the contact is always on, the inlet blower will not begin the second ramp and the bubble will not inflate.]* Wait until the outlet blower has reached the final speed. Now, turn off the outlet blower. The speed display should immediately decrease to 00.0 percent. Also, the inlet blower should immediately start to decrease to about 50 percent of the MSR setting.

   If the outlet speed display does not immediately decrease to zero after turning it off, check the VFD parameters to make sure the VFD is setup for coast to stop operation. If the inlet blower never starts to decrease, make sure the outlet health contact is opening when the outlet VFD is turned off.

Testing the VFD Accel/Decel Functions

Both the inlet and outlet blower VFD must be able to manage the energy generated in accelerating and decelerating the fan wheels under the normal operation of the IBC system. This test provides a method to quickly determine if the VFD can support the normal functions required by the IBC system during startup, shut down and hole recovery functions.

Figure 4 – Main IBC Panel

1. Turn off both the inlet and outlet blower off. Set the MSR potentiometer to three-quarter scale (75%).

2. Turn on the inlet blower; the speed display should immediately begin to ramp from 00.0% to roughly 37.5%. If the speed is not indicating properly, verify that the potentiometer reference voltage from the outlet blower VFD is properly configured for 10 volts maximum. Also verify the analog output from the VFD is configured properly (0-10 volts).

3. If the outlet VFD is providing more than 10 volts, it will be necessary to reduce the voltage with a trim resistor. Refer to the VFD manual for specific instructions on how to do this. If the VFD can only be configured for 0-20ma, you will need to install a 499-ohm resistor across the signal input leads of the speed % panel meter inside the IBC system panel.

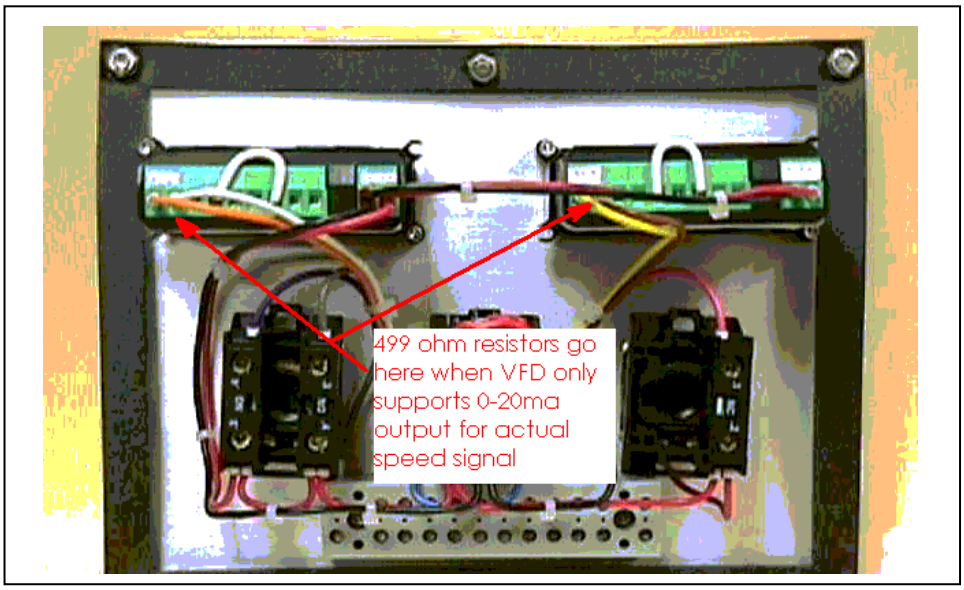

Figure 5 – Current Loop Resistor Installation Points

4. Turn on the outlet blower. The outlet blower will begin to ramp. Just before the outlet reaches the speed of the inlet blower, the inlet blower will begin ramping to a setting of 75% plus an amount established by current bubble conditions. Since this test is done without a bubble, the exact speed cannot be specified here. When both blowers are finished ramping, the outlet blower should be at 75%. The inlet blower generally should be at a speed above 75%.

5. Now, adjust the MSR pot quickly to 50%. Both blowers should decelerate to the new MSR setting (again, the inlet will not match exactly). If either VFD trips, see step 7.

6. Now, adjust the MSR pot quickly back to 75%. Both blowers should accelerate to the new MSR setting with the inlet arriving at the new speed slightly before the outlet blower. If either VFD trips, see step 7.

7. With the MSR pot still set to 75%, turn off the outlet blower. The outlet blower should coast to a stop and the inlet blower should ramp down to roughly 50% of the MSR setting without incurring a fault.

8. If either VFD trips because of an over current or DC bus over voltage, refer to the VFD manual to make the necessary adjustments to correct the condition. **Do not change the accel or decel rates on either VFD**. The IBC system provides conservatively ramped signals for all speed change requests and is not the source of drive fault issues. It may be necessary to install dynamic braking resistors on the VFD to prevent deceleration related VFD faults. If either VFD cannot be made to perform these tests, also check the fan and motor assembly to ensure there are no mechanical problems causing the drive fault. If there are no mechanical problems, then it will be necessary to replace the drive with a unit capable of handling the requirements. Contact D.R. Joseph for assistance in selecting an appropriate VFD.

OTHER ISSUES

Because the IBC system works on a state transition model to determine how the blowers are running, it is possible for faulty wiring to cause a false transition to a state. For instance, if both blowers are running and the outlet health drops out for less than 100 milliseconds, it is possible that the computer will slow down the inlet blower as per test #5 above. This will cause loss of the bubble. Verify that all wiring is properly and securely terminated.

It is also normal that if the IBC system loses power while either or both the blowers are running, the IBC system will not automatically restart the blowers until the switches are manually turned off and then turned back on. This is a safety feature that ensures that blowers will not start unexpectedly. If the reported problem is no analog reference signal to the inlet drive, verify the inlet blower switch has been cycled to the off position since power was applied to the IBC system. Also reverify that the inlet blower health contact is turning off when the control switch is placed in the off position.