



TURBINE TIPS

Turbine Tips provided by Pond and Lucier, LLC. ®

634 Plank Road, Suite 103 Clifton Park, NY 12065

Phone: 518.371.1971 Fax: 518.371.1756 E-mail: pal@pondlucier.com



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Subject: What is the function of the 4VC?

Applies to: General Electric Gas Turbines with Speedtronic™ Mark I

General Electric gas turbines installed in the early 1970s had a “mysterious” relay called **4VC**. Since it is a “4” type relay, it suggests that it is part of the turbine’s Master Protective circuit. The VC name is curious, for sure. Consulting the index on a typical set of gas turbine elementary diagrams, you will find that the VC stands for *VCE Clamp*.



Fig. 1: The 4VC Relay

The **4VC** relay “clamps” the variable control voltage (called **VCE**) to analog common (**ACOM**) whenever the relay is **not** energized. Furthermore, it needs to energize (and remain energized) whenever the master relays are energized. Should the relay fail during turbine operation, **VCE** will go to zero volts and trip the turbine. Thus, it is a “weak link” in the operation of the gas turbine. The turbine will not “fire” during start-up if it is not energized; should it fail during operation, down comes the turbine. What is most disturbing though is that there are no other electrical contacts used to initiate an alarm when it fails, as shown on the turbine elementary sheet 05A beneath the coil!

So why, you might ask, is it there? A good question. If you have ever tried to test the start-up control just prior to start by pushing the buttons on the SSKA card, and VCE does not rise, it might be because the 4VC relay is burned out. Remember, the lamp inside the 4VC relay must show that it is energized, or these pushbuttons will not work.



Fig. 2: VCE Panel Meter

Try this test. While the turbine is at rest, switch the Operation Selector Switch (called 43 Off, Crank, Fire, Auto or Remote) in the **OFF** position. See Fig. 3 below. It is currently shown in the **REMOTE** position.



Fig. 3: Operation Selector Switch (called Switch 43)

Then push one of the buttons on the front of the **STKA** card. See Fig. 5 below. You should see the **VCE** needle rise on the control panel.

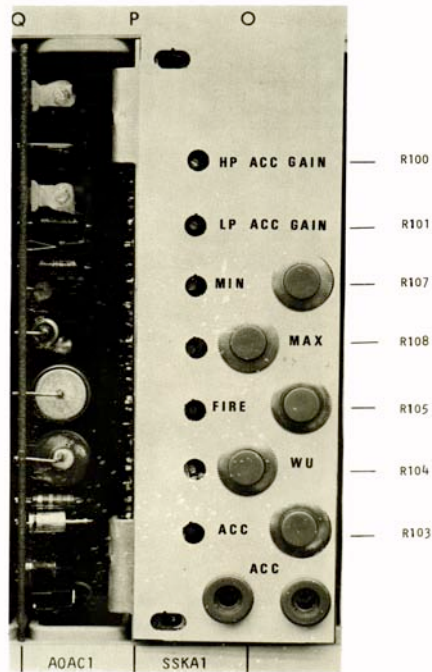


Fig. 4: Start-up Card SSKA

If the **VCE** needle does **NOT** rise, open the panel and see if the **4VC** relay is energized with its internal light **ON**. If it is not energized, remove relay **4VC** and perform the test again with the pushbuttons. Now replace the faulty relay.



Fig. 5: Relay Panel inside Speedtronic™ Door

Look in the gas turbine elementary diagrams for the coil of **4VC**. It is typically shown on Sheet 05A. Then look at spare contacts associated with this relay. See if any other contacts are being

used other than the “clamp” to analog common (**ACOM**). If not, you can use a spare annunciator or **LINA** circuit to indicate that the relay has failed.



Fig. 6: Photo (center) shows 4VC relay removed from plug-in slot

The GE concept was kind of a “belt and suspenders” approach to tripping the gas turbine. Certainly the “4s” circuit will de-energize the fuel solenoids and shut off fuel. However, this relay is designed to make the VCE go to zero simultaneously. The problem is, if this relay should ever fail during turbine operation, the unit will flame out without any pertinent alarm. This will be a “mystery” trip with no annunciation to help in the troubleshooting of the protective circuit.

Contact **Pond and Lucier, LLC** if you have any questions regarding 4VC relay. Call David Lucier on 518-371-1971 or email dave@pondlucier.com.