DS200TCQA – Analog IO Board

The Analog IO Board (TCQA) scales and conditions many of the analog signals read in by terminal boards mounted on the I/O cores <R1>, <R2>, and <R3>. These signals include the LVDT inputs, servo valve outputs, thermocouple inputs, 4–20 mA inputs and outputs, vibration inputs, relay driver outputs, pulse inputs, voltage inputs, and generator and line signals. Some of the signals are written to the STCA board via the 3PL connector. The generator and line signals are exchanged with the TCQC board via the JE connector. 4–20 mA input signals such as the fuel flow pressure and compressor stall-detect signals are scaled and conditioned on the TCQA board.

TCQA Connectors

2PL – Distributes power from the TCPS board in the <R1>, <R2> and <R3> cores..

3PL – The Data Bus between the STCA and TCQA boards in cores <R2> and <R3> and between STCA, TCQA, and TCQE boards in core <R1>. Conditioned signals are carried on 3PL for transferring to the COREBUS.

JA – Carries the thermocouple inputs and cold junction compensation from the TBQA board connector JAR/S/T for cores <R1>, <R2>, and <R3> respectively.

JB – Carries the 4–20 mA inputs and outputs to/from the TBQC terminal board connector JBR.

JD – Carries trip signals to the TCTG board in the <P1> core from the <R1> core, not used in <R2> or <R3>.

JE – Carries the servo valve driver outputs, relay driver outputs, generator and line signals, and the pulse signals to/from the TCQC board. Carries the power supply monitor inputs.

JF – Carries the LVDT/LVDR position inputs from the TBQC terminal board connector JFR.

JG – Carries the vibration inputs from the TBQB terminal board connector JGR and carries the +/- 10 V dc inputs.

The hardware document in Appendix B and the signal flow diagrams in Appendix D contain more information.

TCQA Configuration

Hardware. Hardware jumpers J1 and J2 are used to select the mA output circuits. J5 and J6 are used to configure the mA outputs current range, either 20 mA maximum or 200 mA maximum. J7 is used for the RS232 port for card tests. J8 enables an oscillator. Refer to Appendix A and the hardware jumper screen on the operator interface for information on the hardware jumper settings for this board.

Software. I/O Configuration constants for the thermocouples, pulse rates, vibrations, LVDT positions and the 4–20 mA inputs and outputs are entered in the I/O Configuration Editor located on the operator interface as described below.

Pulse Rate Input Circuit

The TCQA board contains the circuitry that scales and conditions the pulse rate inputs read from the TCQC board via the JE connector. These signals originate from the TTL (transistor to transistor logic) and magnetic pick up inputs whose signals are brought into the QTBA and/or PTBA terminal boards. The <R1> core receives the high pressure shaft speed inputs. The pulse rate input circuits on <R2> and <R3> may be used for other signals.

TCQA 4–20 mA Input Circuits

The TCQA board provides the circuitry for the 4–20 mA and 0–1 mA input signals. The signals are read from the TBQC terminal board via the JB connector. The transducer current is dropped across a burden resistor and the voltage drop is read by the TCQA board and written to the I/O Engine via the 3PL connector. Hardware jumpers on the TBQC terminal board are used to select the current range of the input signals.

TCQA 4–20 mA Output Circuit

The TCQA board provides the circuitry for driving 4–20 mA outputs to the TBQC terminal board via the JB connector. These signals are typically used to drive control devices.

TCQA Thermocouple Circuit

Thermocouples are connected to the TBQA terminal board. Circuits also located on the TBQA terminal board provide the thermocouple cold junction reference, which are used by TCQA to calculate the cold junction compensation. The TCQA board uses the thermocouple input and compensation value to calculate the actual temperature read by the thermocouple. The I/O Engine reads the value via the 3PL connector. Thermocouple types and curves are selected using I/O configuration constants.

TCQA LVDT/R Circuit

Linear Variable Differential Transformers (LVDT) or Linear Variable Differential Reactors (LVDR) are used to detect the position of actuators. The position signals are read from the TBQC terminal board via the JF connector. The scaled and conditioned signals are used by the Control Sequence Program (CSP). The excitation signals for the LVDT/R's are written to the QTBA terminal board via the TCQC board. The LVDT/R's are typically used for regulating servo valve outputs.

TCQA Seismic Vibration Circuit

The seismic vibration sensors are terminated on the TBQB terminal board in <R2> and <R3> and read by the TCQA board of the <R1> and <R3> cores respectively. The signals are scaled and conditioned and written to the Control Engine to be used by the CSP for monitoring and protection. Scaling values are selected in the I/O Configurator on the operator interface.

TCQA Generator And Line Circuit

In the <R1> core , the generator and line feedback signals from the Turbine Trip Board (TCTG) pass to the TCQC board through the TCQA board via JD and JE connectors .