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GE Industrial Systems

SCR-Diode Converter Interface Board
IS200SCNVG_A_ _

These instructions do not purport to cover all details or variations in equipment, nor to provide every possible contingency to be met during installation, operation, and maintenance. If further information is desired, or if particular problems arise that are not covered sufficiently for the purchaser's purpose, the matter should be referred to GE Industrial Systems.

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Safety Symbol Legend

WARNING Indicates a procedure, practice, condition, or statement that, if not strictly observed, could result in personal injury or death.

CAUTION Indicates a procedure, practice, condition, or statement that, if not strictly observed, could result in damage to or destruction of equipment.

Note Indicates an essential or important procedure, practice, condition, or statement.

Contents

Functional Description

The IS200SCNV SCR-Diode Converter Interface Board (SCNV) is the control to bridge interface board for Innovation Series SCR-Diode Converters (1800 amp and 1000 amp stand-alone units). It is used for 6-pulse sources driving three SCRs (66 mm or smaller) per board. It is not used for driving paralleled SCRs from the same board. The SCNV board includes three input current sense circuits, three SCR gate drive circuits, two line-to-line voltage feedback circuits, one dc link voltage feedback circuit, one DB IGBT VCE feedback circuit, and one Dynamic Braking (DB) IGBT gate drive circuit.

The DRVP5 and NDRPC signals from the IS200BIC_ Bridge Interface Board (BIC_) are used to disable/enable gating. DRVP5 should be high (+5 V) and NDRPC

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should be low (DCOM) in order to enable gating. The gate drive is disabled when either DRVP5 goes low or NDPRC goes high. Driver and feedback circuits are galvanically and optically isolated.

A serial add-only memory device is provided on the SCNV board. This memory is programmed with board identification and revision information. Access to the information is through a single data line (BRDID) on the P1 connector.

The SCNV board mounts in slot 6 of the Innovation Series™ board rack and connects to J15 of the IS200CABP Control Assembly Backplane Board (CABP). See Figure 1 for a block diagram of the SCNV board.

DB IGBT Gate Drivers

There is one isolated IGBT gate driver circuit for dynamic braking (DB, optional). The circuit is composed of an optically isolated hybrid gate driver module and a few discrete components. The module switches the IGBT gate-to-emitter voltage between VCC (+15 V) and VEE (–7.5 V).

Two types of faults are generated by this circuit.

- A **Desaturation Fault** is generated when the IGBT is commanded to turn on and VCE exceeds 10 V for

Line-to-Line Voltage Feedback: There are two isolated line-to-line voltage feedback circuits for VAB and VBC. Input line-to-line voltage is monitored by deriving two VCO signals, VAB and VBC, from the input phase shunt connections. The circuits share power supplies and clock oscillators with phase B and C shunt feedback circuits, VAB corresponds to phase B and VBC corresponds to phase C. The VCOs have a range of 0 – 2 MHz and the circuit is biased so that a zero line-to-line voltage produces a nominal output of 976.8 kHz. A ±1 V change in line-to-line voltage translates into a ±959.58 Hz change in output frequency. The outputs of

4 microseconds or longer. When a desaturation fault occurs, the module will slowly decrease VGE until the IGBT is OFF (soft shutdown).

- A **Driver Supply Undervoltage Fault** is generated when the voltage between VCC and VEE drops below 16 V.

These faults are ORed together and optically coupled back to the control logic. These faults are transient in nature and must be latched by the fault handling circuit monitoring the faults through P1 (this is done on the BIC_ board).

SCR Gate Drivers

There are three individually isolated SCR gate driver circuits. Each circuit uses the same hybrid module used in the DB gate drive circuit, but in a different configuration. The SCR gate driver circuit switches between VCC (22 V) and VEE (0 V) to deliver the gate current. No SCR gate driver faults are reported on this board.

Feedback Signals

Shunt Current Feedback: Output phase current is monitored by deriving a voltage controlled oscillator (VCO) output signal from the voltage dropped across the phase shunt. This voltage is amplified and then passed on to the VCO circuitry. The VCO has a range of 0 – 2 MHz and the circuit is biased so that at zero current the nominal output is 1 MHz. A ±400 millivolt shunt voltage is converted into a ±800 kHz change in the VCO output frequency. The output of the VCO is optically coupled to a differential driver interface to the control logic.

the VCOs are optically coupled to the control logic. The line-to-line voltage feedback circuits have an input filter with break frequency of 17.46 kHz.

Dc Link Voltage Feedback: There is one isolated dc link voltage feedback circuit. The dc link voltage feedback circuit shares its power supply with the DB IGBT VCE feedback circuit. It is referenced to the negative dc link that is the same as the DB IGBT emitter. The positive dc link input is fed to the VCO circuit through a resistive attenuator. The VCO has an output range from 0 – 2 MHz. The input is scaled so that 0 – 1197.5 link volts corresponds to 0 – 2 MHz. The output of the VCO is optically coupled to the control logic. The dc link voltage feedback circuit has an input filter with a break frequency of 10.03 kHz.

DB IGBT VCE Feedback: There is one isolated DB IGBT VCE feedback circuit (if equipped with DB option). It shares its power supply with the dc link voltage feedback circuit. It is referenced to the DB IGBT emitter that is the same as the negative dc link. The DB IGBT collector input is fed to the VCO circuit through a resistive attenuator. The VCO has an output range of 0 – 2 MHz. The input is scaled so that 0 – 1197.5 Volts corresponds to 0 – 2 MHz. The output of the VCO is optically coupled to the control logic. The DB IGBT VCE voltage feedback circuit has an input filter with a break frequency of 10.03 kHz.

DB Temperature Fault

An isolated 15 V supply (P15T) is used as a power supply for the DB temperature fault circuit (if equipped with DB option). The signal DBTF is used to enunciate DB temperature faults to the BIC_ board. Under normal conditions (no faults), the externally supplied thermostat contact is closed and 12 milliamps flow into the optocoupler causing DBTF to be low.

When a fault occurs (DB heatsink temp > thermostat threshold), the thermostat contact opens and no input current flows into the optocoupler causing DBTF to be high.

Power Supplies

Regulated +5 V dc (P5) and DCOM are supplied to the SCNV board via the P1 connector. A 25 kHz, 18.4 V ac square wave input (VAC1 and VAC2) is also supplied to the SCNV board transformer primaries through the P1 connector (unregulated). There are nine power supplies derived from the secondaries of the four transformers as follows:

- **T1, Phase A SCR Gate Drive Supply:** Isolated +22.5 V halfwave supply referenced to the positive dc bus. (unregulated, ±10%, maximum 1 amp average)
- **T1, Phase A Shunt Feedback Supply:** Isolated +12, –12, +5 V fullwave supply referenced to the bridge side of shunt A. (unregulated except 5 V supply, ±10%, maximum 100 milliamp average for each voltage)
- **T2, Phase B SCR Gate Drive Supply:** Isolated +22.5 V halfwave supply referenced to the positive dc bus. (unregulated, ±10%, maximum 1 amp average)
- **T2, Phase B Shunt Feedback/VAB Feedback Supply:** Isolated +12, –12, +5V fullwave supply referenced to the bridge side of shunt B. (unregulated except 5 V supply, ±10%, maximum 100 milliamp average for each voltage)
- **T3, Phase C SCR Gate Drive Supply:** Isolated +22.5 V halfwave supply referenced to the positive dc bus. (unregulated, ±10%, maximum 1 amp average)
- **T3, Phase C Shunt Feedback / VBC Feedback Supply:** Isolated +12, –12, +5V fullwave supply referenced to the bridge side of shunt C. (unregulated except 5 V supply, ±10%, maximum 100 milliamp average for each voltage)
- **T4, DB IGBT Gate Drive Supply:** Isolated +15/-7.5 V halfwave supply referenced to the DB IGBT emitter = negative dc bus. (unregulated, ±5%, maximum 1 amp average)
- **T4, DC Link Voltage/DBVCE Feedback Supply:** Isolated +12, –12, +5V fullwave supply referenced to negative DC bus = DB IGBT emitter. (unregulated except 5 V supply, ±10%, maximum 100 milliamp average for each voltage)
- **T4, DB Temperature Fault Supply:** Isolated +15 V halfwave supply (unregulated, ±10%)

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