GE Drive Systems

Application and Replacement Instructions For SVIA Shunt Isolator Board

DS200SVIAG1_ _ _

These instructions do not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met during installation, operation, and maintenance. Should further information be desired or should particular problems arise that are not covered sufficiently for the purchaser's purpose, refer the matter to GE Drive Systems, Salem, Virginia, U.S.A.

WARNING

This equipment contains a potential hazard of electrical shock or burn. Only those who are adequately trained and thoroughly familiar with the equipment and the instructions should install, operate, or maintain this equipment.

INTRODUCTION

These instructions provide application instructions and information that may be needed when replacing the DS200SVIA Shunt Isolator Board (SVIA). This information includes descriptions of configurable hardware jumpers and potentiometers (pots), testpoints, and a light-emitting diode (LED).

BOARD IDENTIFICATION

A printed wiring board is identified by an alphanumeric part (catalog) number stamped on its edge. For example, the Shunt Isolator Board is identified by part number:

DS200SVIAG#ruu

The *DS200SVIA* portion is the base number that identifies the printed wiring board, in this case, the Shunt Isolator Board. The *G#* identifies a group, which is a variation of a particular board. The *r* and *u* digits are alphabetic characters that indicate the board revision level. The *r* digit reflects a functional change that is not downward compatible. It is essentially a new catalog number. The *u* digits represent revision levels that are downward compatible to the *r* revision level.

NOTE

All digits are important when ordering or replacing any board.

SVIA BOARD DESCRIPTION

The SVIA provides isolation of shunt current signals. The mV signal from a shunt is amplified by the input stage of the SVIA, and is isolated from the common mode voltage that exists in the power circuit. Several standard input resistors are provided to amplify ±100 mV to ±475 mV shunt signals to ±7.5 V outputs.

The SVIA requires an unregulated supply of +24 V dc, ±25%, 80 mA input power.

The SVIA board is supplied as part of the Current Isolator Module. Two versions of this module are available:

336A3484G1 – Module without mounting bracket; includes SVIA board and enclosure only. Module door opens towards side of drive enclosure.

336A3484G2 – Module with mounting bracket; includes SVIA board, enclosure, and mounting bracket. Module door opens towards front of drive enclosure.

The SVIA board consists of three stages: the high-gain input stage, the unity gain isolation stage, and the variable gain and offset adjust output stage. Figure 1 is a simplified elementary diagram of the SVIA, showing each of these stages.

Input Stage

The input stage includes a differential amplifier with a 7.5 kΩ feedback resistor. Five input connections enable the user to select the input gain required by the application. Four of the five inputs (TB1-3, TB1-5, TB1-6, and TB1-7) feature fixed input resistors, for the gains shown in Table 1.

The fifth input (TB1-1) is connected to a set of saddle clamps that enable the user to install the required input resistor, designated R11, for the desired gain. Resistor R11 can be determined from the following equation:

$$R11 = \frac{\textit{Shunt Voltage (mV)} \times \textit{1 pu Current (A)} \times 7500\ \Omega}{1000\ \textit{mV} \times \textit{Shunt Current (A)} \times \textit{Desired Output Voltage}}$$

The output of the SVIA board is typically connected to a DS200DCFB Power Supply Board (DCFB). In these applications, the desired output voltage is 1 V.

If necessary, for armature current feedback, adjust EE.1505 (CFBSF0) to produce 5000 counts at 1 pu when the 1 pu current does not correspond to the drive or exciter's shunt rating, or when the closest available resistor is not the exact value found in the above equation. This adjustment is made using the ST2000 Toolkit (see GEH-5860) or Drive Configurator, LynxOS Version (see GEH-6203).

Terminal board point TB1-2 provides the other input to the input stage differential amplifier. To invert the polarity of the SVIA output, connect the positive input to TB1-2, and the negative input to the terminal selected above for the desired input gain.

Table 1. SVIA Input Gain

Input Terminal	Input Resistor (Ω)	Gain
TB1-1	User selected	7500/R11
TB1-3	7500	Unity
TB1-5	475	16
TB1-6	221	34
TB1-7	100	75

FOR MOTORS R11 = 240 Ω
FOR GENS R11 = 241 Ω
250 Ω USED IN BOTH

The input stage voltage can be observed by measuring between testpoints TP7 (VINI) and TP2 (ACOMIS). Table 3 lists and defines the SVIA board testpoints.

The input stage features a 2 µF, 100 V filter capacitor for the TB1-1 input. Jumper J1 is used to select whether the filter capacitor is connected to the input circuit. The capacitor should be connected for low impedance input voltages, such as shunt mV signals, which have a high common mode voltage to ground.

The input stage also features a test circuit used to calibrate the SVIA. Berg-type jumper J2 is used to set the range of pot R3 (TEST) to either ±200 mV or ±10 V. R3 adjusts the dc test voltage output at TB1-4 to the voltage required by the application. The test voltage can be observed by connecting a measuring device between TP3 (TEST) and TP2 (ACOMIS).

Isolation Stage

The isolation stage is powered by an isolated ±15 V dc power supply. Input power to the SVIA can be provided by the most convenient unregulated +24 V dc, ±25%, 80 mA source. The +24 V dc input is connected to a +15 V regulator which powers the isolated power supply. The POWER ON LED lights when +15 V dc is available at the regulator output. The isolated power supply uses the +15 V regulator output to produce separate unregulated ±15 V dc, 5 mA power for the input and output stages.

Normally open contacts of relay K1 provide an interlock between terminal board points TB2-7 and TB2-8 to indicate a loss of power to the SVIA. The contacts open when power is lost.

The isolation stage is set up for unity gain to provide the best common mode rejection and temperature performance, least phase shift, and stable gain-versus-frequency characteristics. This stage provides 2500 V rms (continuous) and ±3500 V peak (continuous) common-mode isolation between any two ports.

Output Stage

The output stage provides variable gain and offset for the SVIA. Pots R2 and R1 provide gain and offset adjustment, respectively, for the output stage. For best performance, configure the SVIA such that most of the required amplification is achieved at the input stage; use R2 as a vernier adjustment. Pot R1 provides a ±20 mV variation in the output voltage when R2 is fully counterclockwise.

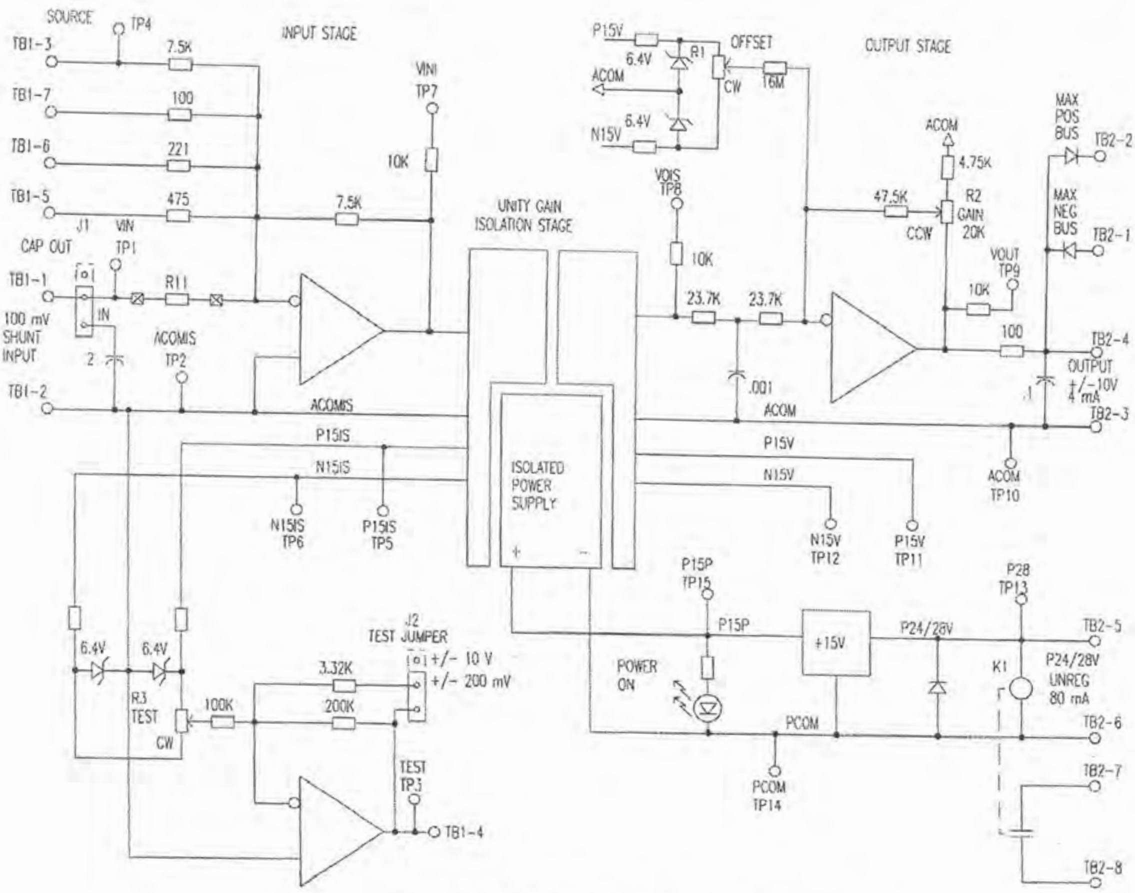

Figure 1. SVIA Simplified Elementary Diagram

The range of the output voltage is ±10 V at 4 mA maximum. The SVIA outputs are at terminal board points TB2-4 and TB2-3.

Voltage Isolation Function

Using input connections TB1-1 and TB1-2, the SVIA can be used to perform voltage isolation. Armature-level voltages can be further attenuated by connecting a DS200SVAA Voltage Attenuator Board between the shunt and the SVIA. Input TB1-1 should be used with R11 selected per the following equation; jumper J1 should be in the OUT position to remove the filter capacitor from the input circuit. Select R11 as shown:

$$R11 = \frac{\left[\left(\frac{V_{IN}}{V_{OUT}} \times 7.5k\Omega\right) - 600k\Omega\right] \times 475k\Omega}{475k\Omega + 600k\Omega}$$

where V_{IN} is the input voltage to the SVAA, V_{OUT} is the output voltage of the SVIA, and the SVAA attenuation is set for the default value of 0.442.

Current Signal Converter

The SVIA can also be used to convert a 4-20 mA current signal into a 0-10 V dc signal. In this application, connect a 500 Ω resistor across TB1-1 and TB1-2, and connect the input to these points. Connect TB1-4 to TB1-3. Insert a 7.5 kΩ resistor in R11 and set jumper J2 to the 10 position to select the ±10 V range. This provides a -2.0 V bias at TB1-3. This configuration results in an output voltage at TB2-4 of 0-8 V with pot R2 fully counterclockwise. Adjust R2 to suit the application.

PROCEDURE FOR REPLACING BOARDS

WARNING

Turn off all power to the shunt connected to the SVIA before replacing the board. Potentially lethal voltages may be present on the board when powered. To prevent electric shock, turn off power to the board, then test to verify that no power exists in the board before touching it or any connected circuits.

CAUTION

To prevent equipment damage, do not remove boards or connections, or re-insert them, while power is applied to the drive or exciter.

Treat all boards as static-sensitive. Use a grounding strap when changing boards and always store boards in the boxes in which they were shipped.

To replace the SVIA board:

1. **Turn off power to the drive or exciter,** then wait a few minutes for the power supply's capacitors to discharge. Test any electrical circuits before touching them to ensure that power is off.

2. Open the drive or exciter's cabinet door to access the printed wiring boards. Locate the Current Isolator Module and open the module door to access the SVIA.

3. To remove the SVIA board, carefully remove all cables from terminal boards TB1 and TB2. After noting the location of each wire, loosen the screws at the top of the terminal boards and gently pull each wire free.

4. The SVIA is held in place by four screws, one in each corner of the board. Remove these screws to remove the board.

5. On the replacement (new) board, set all configurable items (jumpers and pots) in the exact position as those on the board being replaced (old board).

   If a board revision has added or eliminated a configurable component, or re-adjustment is needed, refer to Table 2.

NOTE

Because of upgrades, boards of different revision levels may not contain identical hardware. However, GE Drive Systems ensures compatibility of its replacement boards.

6. If resistor R11 is present on the board being replaced, loosen the saddle clamp screws to remove the resistor. Install the resistor in the same place on the new board.

7. Install the new board, ensuring that the four mounting screws are tightened securely.

8. The wires are labeled with the correct connector name and terminal number, as marked on the board. Reconnect all wires to the terminal boards. Ensure that the screw terminals are tightened securely.

HARDWARE ADJUSTMENTS

The SVIA includes Berg-type (manually moveable) jumpers, identified by a *J* nomenclature, and pots, identified by an *R* nomenclature. The jumpers are used for manufacturing test and customer options. The pots are used to adjust operating parameters of the SVIA. Figure 2 shows the layout of the SVIA, including the locations of the jumpers and pots. Table 2 lists and defines these items.

Most of the jumper selections have been factory set. The test data sheets supplied with each controller (in the drive or exciter door pocket) indicate these positions.

As described previously, ensure that the jumpers on the new board are placed the same as on the old board, unless the instructions indicate otherwise. Refer to Table 2, which lists the default setting first.

For optimal performance, set the offset and gain of the SVIA as follows:

1. Disconnect the input wires and connect TB1-4 to the desired input pin of TB1. Set jumper J2 to the desired range (±10 V or ±200 mV). Set JP1 to the OUT position to remove the 2 μF capacitor from the input circuit.
2. Adjust pot R3 (TEST) for 0 V at TB1-4 or TP3 (TEST).
3. Adjust pot R1 (OFFSET) for 0 V at TP9 (VOUT).

4. Adjust R3 for the desired input voltage and adjust pot R2 (GAIN) for the desired output voltage.

5. Set jumper JP1 to the IN position if the SVIA is used as a shunt signal isolator.

TESTPOINTS

The SVIA includes onboard testpoints for use in monitoring signals during adjustments or troubleshooting. Table 3 lists and defines the testpoints. Figure 2 shows the testpoint locations.

LED

The SVIA board includes one LED, designated POWER ON. This LED is lit when the +15 V dc supply from the regulator is present. If the POWER ON LED is not lit, check that +24 V dc is present between TB2-5 (+) and TB2-6 (-). Note if the +24 V dc input is present, relay K1 should close the contacts between TB2-7 and TB2-8. Figure 2 shows the location of the POWER LED.

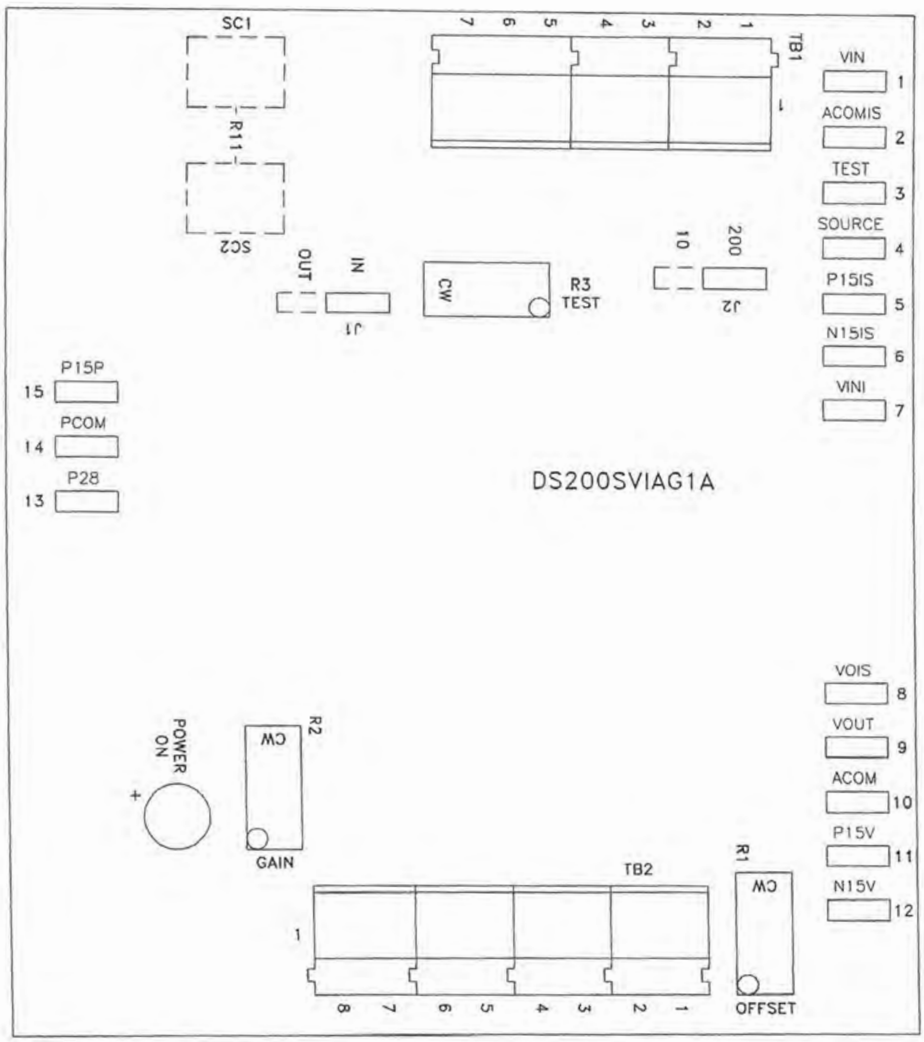

Figure 1. SVIA Board Layout

Table 2. SVIA Board Adjustable Hardware

Revision	Name	Description
All	J1	Connects or disconnects input capacitor Inserts a 2 µF shunting capacitor across the input terminals. Used for dc voltages less than 100 V dc from low impedance sources, such as shunt mV signals, across TB1-1 to TB1-2. IN Capacitor in for TB1-1 to TB1-2 for such as shunt mV signals OUT Capacitor out for TB1-1 to TB1-2 for voltage signal isolation
All	J2	Range select for test voltage output on TB1-4 Changes the range of the test output voltage to TB1-4 and TP3 (see Table 3). This test voltage output is adjusted via pot R3. 200 200 mV range on R3 (TEST) 10 10 volt range on R3 (TEST)
All	R1	Offset potentiometer R1 is used to adjust the dc offset of the isolator module to zero. With zero volts in on the TB1 input, adjust R1 for 0.0 volts dc on the output, TB2-4 or TP9 (see Table 3).
All	R2	Gain potentiometer R2 is the gain adjust to obtain the correct dc scaling on the isolator output, TP9 (see Table 3) and TB2-4. Typically, R2 is adjusted to give 1 V on the output with 1 per unit current flowing through the instrumented shunt.
All	R3	Test voltage output (TB1-4) adjust R3 is used to adjust the dc test voltage output (TB1-4) to the voltage required by the application. Typically, the test voltage output will be set the same as the millivolts output of the armature shunt connected to the input with 1 per unit current flowing.

Table 3. SVIA Board Testpoints

Name	Description	Revision
VIN	Monitors the voltage on input terminal TB1-1, typically the positive terminal on a shunt.	All
ACOMIS	Monitors the voltage on input terminal TB1-2. Also is the common input to the SVIA. Typically the negative terminal on a shunt.	All
TEST	Monitors the test voltage output, used to adjust the gain of the isolator card. See R3 description in Table 2 for test voltage adjustment. This signal is also available at TB1-4.	All
SOURCE	Monitors the voltage on TB1-3, the unity gain voltage source inputs.	All
P15IS	Monitors the isolated +15 V dc power supply for the isolator input stage.	All
N15IS	Monitors the isolated -15 V dc power supply for the isolator input stage.	All
VINI	Monitors the output of the preamplifier which preconditions signals before the isolation stage.	All
VOIS	Monitors the isolation stage output before the final stage amplifier.	All
VOUT	Monitors the overall output of the SVIA after the final stage amplifier.	All
ACOM	Monitors the output stage amplifier common.	All
P15V	Monitors the +15 V dc power for the output stage amplifier.	All
N15V	Monitors the -15 V dc power for the output stage amplifier.	All
P24	Monitors the 24 V dc power supply input – positive side.	All
PCOM	Monitors the 24 V dc power supply input – negative side.	All
P15P	Monitors the +15 V dc power input to the internal isolated power supply.	All

Notes:

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