GE Motors & Industrial Systems

SIGNAL PROCESSOR CARD
531X309SPC_ _G1

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 Motors & Industrial Systems.

CONTENTS

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.

FUNCTIONAL DESCRIPTION

The 531X309SPC Signal Processor Card (SPC) processes I/O for the Local Area Network (LAN) control board and for the drive control board. Its functions include:

- Interfacing with 5 to 15 V incremental encoders or digital tachometers to supply speed feedback to the drive control board for speed regulated centerwinds.
- Converting three additional current reference signals and one voltage level signal into voltage reference signals, then transmitting these to the drive control board.
- Receiving RS-422 serial commands from the master controller, and sending these to the drive control board's Motor Control Processor (MCP).

APPLICATION DATA

CONFIGURABLE ITEMS

Most of the switch selections, jumper selections, and potentiometer adjustments have been factory-set. When changing this board, make sure the replacement board's switches, jumpers, and potentiometers are set in the same position on the new board as they were on the board being replaced.

The test data sheets supplied with each controller (typically located in the drive door pocket) indicate the position of these adjustments as they were set at the factory.

JUMPERS, SWITCHES, AND POTS

The SPC card (see Figure 2) includes Berg-type (manually moveable) jumpers; a DIP switch (revisions AA – AF of the SPC card included two DIP switches); and six potentiometers (pots).

- The switch(s) selects the hardware interface configuration. See Tables 1A, 1B, and 1C for information on the switch settings.
- The jumpers are used for manufacturing tests or customer options. See Table 2 for descriptions of the various jumper settings.
- The pots adjust the biasing, gain, and filtering of signals. The initial setting is the straight-up (12 o'clock) position (see Figure 1). (The limit of rotation is approximately 150 degrees in either direction from the straight-up position.) See Table 3 for a listing of the SPC card's pots, pot descriptions, and default positions.

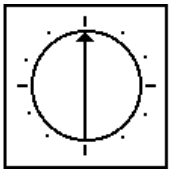

Figure 1. Pot Set At Straight-Up Position

INPUT/OUTPUT (I/O)

Connector **7PL** supports I/O between the SPC card and the drive control board. See Figure 2 for the location of this connector, and Table 4 for the nomenclature and description of the individual pin signals.

Ribbon connector **16PL** and terminal block **1TB** both support I/O between the SPC card and external connections. Figure 2 shows the locations of these connectors, and Table 5 lists the nomenclatures and descriptions of the signals they support.

TESTPOINTS

The SPC card's onboard testpoints permit access to critical signal paths for test purposes. See Table 6 for information on the use of each testpoint.

Table 1A. SPC Card Switch Values, Revision AA – AF (SW1)

Name	Description
SW1-1 SW1-2	Selects input attenuation resistors for channel A of encoder #1 Input attenuation resistors for channel A of encoder #1 can be selected as follows: 1-1 & 1-2 both OFF 15 volt encoder interface 1-1 ON & 1-2 OFF 5 volt encoder interface 1-1 OFF & 1-2 ON 5 volt encoder (alternate setting) 1-1 & 1-2 both ON External attenuation
SW1-3 SW1-4	Selects input attenuation resistors for channel B of encoder #1 Input attenuation resistors for channel B of encoder #1 can be selected as follows: 1-1 & 1-2 both OFF 15 volt encoder interface 1-1 ON & 1-2 OFF 5 volt encoder interface 1-1 OFF & 1-2 ON 5 volt encoder (alternate setting) 1-1 & 1-2 both ON External attenuation
SW1-5 SW1-6	Selects input attenuation resistors for marker channel of encoder #1 Input attenuation resistors for marker channel of encoder #1 can be selected as follows: 1-1 & 1-2 both OFF 15 volt encoder interface 1-1 ON & 1-2 OFF 5 volt encoder interface 1-1 OFF & 1-2 ON 5 volt encoder (alternate setting) 1-1 & 1-2 both ON External attenuation
SW1-7	Unused

Table 1B. SPC Card Switch Values, Revision AA – AF (SW2)

Name	Description
SW2-1 SW2-2	Selects input attenuation resistors for channel A of encoder #2 Input attenuation resistors for channel A of encoder #2 can be selected as follows: 2-1 & 2-2 both OFF 15 volt encoder interface 2-1 ON & 2-2 OFF 5 volt encoder interface 2-1 OFF & 2-2 ON 5 volt encoder (alternate setting) 2-1 & 2-2 both ON External attenuation
SW2-3 SW2-4	Selects input attenuation resistors for channel B of encoder #2 Input attenuation resistors for channel B of encoder #2 can be selected as follows: 2-3 & 2-4 both OFF 15 volt encoder interface 2-3 ON & 2-4 OFF 5 volt encoder interface 2-3 OFF & 2-4 ON 5 volt encoder (alternate setting) 2-3 & 2-4 both ON External attenuation
SW2-5 SW2-6	Selects input attenuation resistors for marker channel of encoder #2 Input attenuation resistors for marker channel of encoder #2 can be selected as follows: 2-5 & 2-6 both OFF 15 volt encoder interface 2-5 ON & 2-6 OFF 5 volt encoder interface 2-5 OFF & 2-6 ON 5 volt encoder (alternate setting) 2-5 & 2-6 both ON External attenuation
SW2-7	Unused

Table 1C. SPC Card Switch Values, Revision AG – Present (SW1)

Name	Description
SW1-1	Selects input attenuation resistors for channel A of encoder #1 Input attenuation resistors for channel A of encoder #1 can be selected as follows: OFF 15 volt encoder interface ON 5 volt encoder interface
SW1-2	Selects input attenuation resistors for channel B of encoder #1 Input attenuation resistors for channel B of encoder #1 can be selected as follows: OFF 15 volt encoder interface ON 5 volt encoder interface
SW1-3	Selects input attenuation resistors for marker channel of encoder #1 Input attenuation resistors for marker channel of encoder #1 can be selected as follows: OFF 15 volt encoder interface ON 5 volt encoder interface
SW1-4	Selects input attenuation resistors for channel A of encoder #2 Input attenuation resistors for channel A of encoder #2 can be selected as follows: OFF 15 volt encoder interface ON 5 volt encoder interface
SW1-5	Selects input attenuation resistors for channel B of encoder #2 Input attenuation resistors for channel B of encoder #2 can be selected as follows: OFF 15 volt encoder interface ON 5 volt encoder interface

Table 1C. SPC Card Switch Values, Revision AG – Present (SW1) — Continued

Name	Description
SW1-6	Selects input attenuation resistors for marker channel of encoder #2 Input attenuation resistors for marker channel of encoder #2 can be selected as follows: OFF 15 volt encoder interface ON 5 volt encoder interface
SW1-7	Selects input attenuation resistor for serial channel RXP/RXN (1TB-13/1TB-14) RXP and RXN (1TB-13 and 1TB-14) may be used either as the input from a BEI serial absolute encoder, or as the receiver input of a full-duplex RS-422 serial channel to the drive control board's MCP. OFF 15 volt input (Serial encoder interface) ON 5 volt input (RS-422 serial communication)

Table 2. SPC Card Jumpers

Name	Description
JP1	Encoder #1 clock inhibit - Used for test purposes only. 1.2 Enables encoder #1 logic array (normal operation) 0 Inhibits clock to PAL (manufacturing test only)
JP2	Encoder #1 marker channel enable to be used for absolute position 1.2 Inhibit marker, for incremental position or speed only 2.3 Enable marker, for absolute position instrumentation
JP3	Encoder #2 clock inhibit - Used for test purposes only. 1.2 Enables encoder #2 logic array (normal operation) 0 Inhibits clock to PAL (manufacturing test only)
JP4	Encoder #2 marker channel enable to be used for absolute position 1.2 Inhibit marker, for incremental position or speed only 2.3 Enable marker, for absolute position instrumentation
JP5	Select gain of amplifier for the analog channel SPA1 (VAR256) 1.2 Select gain enabled (default setting) 2.3 Select gain disabled
JP6	Select input burdening for PF1P/PF1N of the analog channel SPA1 1.2 No burden (use this setting for 0–30 V dc input) 1.3 Burden for 1–5 or 4–20 mA current loop input (default setting) 1.4 Burden for 10–50 mA current loop input
JP7	Select zero offset for the analog channel SPA1 1.2 No offset 1.3 Negative offset (default setting) 1.4 Positive offset
JP8	Select gain of amplifier for the analog channel SPA2 (VAR257) 1.2 Normal gain (default setting) 2.3 10:1 gain boost for max input <5 mA or <2 V dc
JP9	Select input burdening for PF2P/PF2N of the analog channel SPA2 1.2 No burden for 2–30 V dc input signals 1.3 Burden for 1–5 or 4–20 mA current loop input (default setting) 1.4 Burden for 10–50 mA current loop input
JP10	Select zero offset for the analog channel SPA1 1.2 No offset 1.3 Negative offset (default setting) 1.4 Positive offset

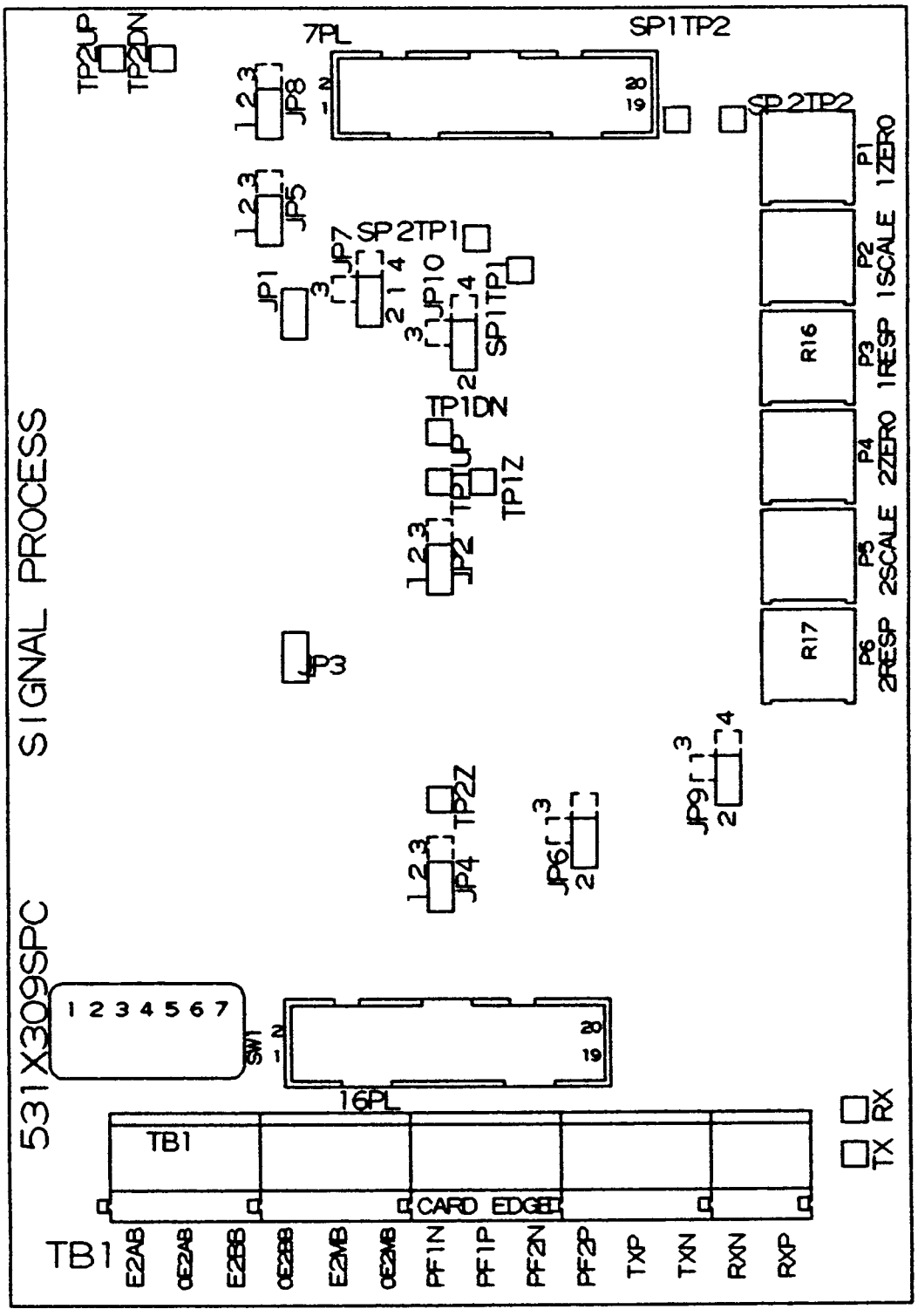

Figure 2. SPC Card Layout Diagram

Table 3. SPC Board Potentiometers

Name	Nomenclature	Description
P1	1ZERO	Provides zero adjustment of SPA1 (see Table 2, JP5) Default position straight-up
P2	1SCALE	Provides gain adjustment of SPA1 (see Table 2, JP5) Default position fully counterclockwise
P3	1RESP	Adjusts response to analog channel #1 (SPA1) from 1 to 1000 msec. Default position fully counterclockwise
P4	2ZERO	Provides zero adjustment of SPA2 (see Table 2, JP8) Default position straight-up
P5	2SCALE	Provides gain adjustment of SPA2 (see Table 2, JP5) Default position fully counterclockwise
P6	2RESP	Adjusts response to analog channel #2 (SPA2), from 1 to 1000 msec. Default position fully counterclockwise

Table 4. Connector 7PL, I/O With Drive Control Board

Pin No.	Nomenclature	Direction	Description
1	SPA1	Output	±5 V dc SPC analog channel #1
2	SPA2	Output	±5 V dc SPC analog channel #2
3	E1Z	Output	Marker channel from encoder #1 interface
4	E2Z	Output	Marker channel from encoder #2 interface
5	N15	Output	–15 V dc power supply for analog circuits on SPC card
6	P15	Output	+15 V dc power supply for analog circuits on SPC card
7	DCOM	Output	Power supply return, common
8	SPRS	Input	Digital output from drive control board’s DCP to SPC card
9	DCOM	Output	Power supply return, common
10	P5	Output	+5 V dc power supply for digital circuits on SPC card
11	E1UP	Output	Up channel output from encoder #1 interface
12	E1DN	Output	Down channel output from encoder #1 interface
13	E2UP	Output	Up channel output from encoder #2 interface
14	E2DN	Output	Down channel output from encoder #2 interface
15	0RST7	Input	System reset (active low)
16	DCOM	Output	Power supply return, common
17	------	N/A	Not Connected
18	------	N/A	Not Connected
19	SPTX	Input	+5 V dc output from the drive control board’s MCP UART
20	SPRX	Output	+5 V dc input to the drive control board’s MCP UART

Table 5. Connectors 16PL and 1TB to External Connections

16 PL Pin No.	1TB Terminal	Nomenclature	Direction	Description
1	------	E1AB	Input	Non-inverting input for encoder #1 channel A
2	------	/E1AB	Input	Inverting input for encoder #1 channel A
3	------	E1BB	Input	Non-inverting input for encoder #1 channel B
4	------	/E1BB	Input	Inverting input for encoder #1 channel B
5	------	E1MB	Input	Non-inverting input for encoder #1 marker channel
6	------	/E1MB	Input	Inverting input for encoder #1 marker channel
7	1	E2AB	Input	Non-inverting input for encoder #2 channel A
8	2	/E2AB	Input	Inverting input for encoder #2 channel A
9	3	E2BB	Input	Non-inverting input for encoder #2 channel B
10	4	/E2BB	Input	Inverting input for encoder #2 channel B
11	5	E2MB	Input	Non-inverting input for encoder #2 marker channel
12	6	/E2MB	Input	Inverting input for encoder #2 marker channel
13	7	PF1N	Input	Inverting input for analog channel SPA1 (VAR.256)
14	8	PF1P	Input	Non-inverting input for analog channel SPA1 (VAR.256)
15	9	PF2N	Input	Inverting input for analog channel SPA2 (VAR.257)
16	10	PF2P	Input	Non-inverting input for analog channel SPA2 (VAR.257)
17	11	TXP	Output	Non-inverting RS-422 output from the drive control board's MCP
18	12	TXN	Output	Inverting RS-422 output from MCP
19	13	RXN	Input	Inverting RS-422 input to MCP
20	14	RXP	Input	Non-inverting RS-422 input to MCP

Table 6. SPC Board Testpoints

Name	Description
SP1TP1	SPA1 differential amplifier output, ahead of potentiometer P1/P2 offset and scaling
SP1TP2	Final output of SPA1 analog input channel, analog version of VAR.256 - An analog voltage of ±5 V dc converts to ±511 counts at VAR.256
SP2TP1	SPA2 differential amplifier output, ahead of potentiometer P4/P5 offset and scaling
SP2TP2	Final output of SPA2 analog input channel, analog version of VAR.257 - An analog voltage of ±5 V dc converts to ±511 counts at VAR.257
TP1UP	Encoder #1 up counter output
TP1DN	Encoder #1 down counter output
TP1Z	Encoder #1 marker channel output (if enabled)
TP2UP	Encoder #2 up counter output
TP2DN	Encoder #2 down counter output
TP2Z	Encoder #2 marker channel output (if enabled)
RX	RS-422 receiver input
TX	RS-422 transmitter output

RENEWAL/WARRANTY REPLACEMENT

BOARD IDENTIFICATION

A printed wiring board is identified by an alphanumeric part (catalog) number stamped on its edge. For example, the SPC Signal Processor Card is identified by part number 531X309SPCcrG1.

The *531X309SPC* portion is the base number that specifically identifies the printed wiring board. The *c* and *r* digits are alphabetic characters that indicate the board configuration and revision level, respectively. The *G#* identifies a group, which is a variation of a particular board. The SPC card has one group, *G1*.

NOTE

All digits are important when ordering or replacing any board.

WARRANTY TERMS

The *GE Motors & Industrial Systems Terms and Conditions* brochure details product warranty information, including the **warranty period** and **parts and service** coverage.

The brochure is included with customer documentation. It may also be obtained separately from the nearest GE Sales Office or authorized GE Sales Representative.

WARRANTY PARTS AND SERVICE

This board has no fuses or other end-user serviceable parts. If it fails, it needs to be replaced as a unit. To obtain a replacement board, or service assistance, contact the nearest GE Service Office. Please have the following information ready to exactly identify the **part** and **application**:

- GE requisition or shop order number
- Equipment serial number and model number
- Board number and description

PROCEDURE FOR REPLACING BOARDS

WARNING

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

To replace an SPC card:

1. **Turn off power to the drive**, then wait several minutes for all capacitors to discharge. Test any electrical circuits before touching them to make sure power is off.

2. Open the drive's cabinet door to access the printed wiring boards.
   - The SPC card is mounted on the drive control board located in the front position of the front carrier in the board rack.

3. Disconnect all cables from the SPC card as follows: (Ensure that all cables and wires are labeled to simplify reconnection.)
   - For ribbon cables, grasp each side of the cable connector that mates with the board connector and gently pull the cable connector free.
   - For cables with pull tabs, carefully pull the tab.
   - For wires attached to connector 1TB, loosen the screw located at the top of each terminal and gently pull each wire free.

4. Remove the four screws with nylon washers that secure the SCP card to the standoffs on the drive control board, then remove the SPC card.

CAUTION

Avoid dropping the hardware into the unit, which could cause damage.

NOTE

Because of upgrades, boards of different revision levels may not contain identical hardware. However, GE Motors & Industrial Systems ensures backward compatibility of replacement boards.

5. Set all configurable items on the replacement (new) board in the exact position as those on the board being replaced (old board). Set all pots in the approximate positions of those on the board being replaced.

   - If a board revision has added or eliminated a configurable component, or re-adjustment is needed, refer to Tables 1 – 3.

6. Orient the new SPC card in the same position as the card removed was and mount it on the four standoffs with the four screws with nylon washers removed in step 4. (Make sure that all screws are securely tightened.)

7. Reconnect all cable connectors that were disconnected in step 3. Make sure that connectors are properly seated at both ends.

8. Reconnect all individual wires that were disconnected in step 3. Make sure that each wire is properly secured in the terminal.

Notes:

GE Motors & Industrial Systems

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