

Sensoray Model 518 SoftPLC Driver

I. INTRODUCTION

The "SR518.TLM" is TOPDOC Loadable Module (TLM) that enables the Sensoray Model 518 PC104 Sensor Coprocessor to be integrated with SoftPLC. The driver reads a user defined configuration file during SoftPLC's initialization sequence. During SoftPLC's Ladder Scan, the Sensoray board is accessed via eleven (11) TOPDOC Ladder Instructions (TLI's). A maximum of four (4) boards may be installed in a single computer. There is also a DOS based standalone calibration program provided to calibrate the coprocessor internal standards.

II. CONFIGURATION FILE

The configuration file "SR518.CFG" is used to set the following parameters for the card: I/O Base Port Address, Timeout, Conversion Speed (22/13 milliseconds/channel), OpenSensor Values, Filter value, Sensor Type Code, and any custom settings. The file can be created with any ascii based text editor and must reside in the start-up or default directory from which the *SoftPLC* kernel (SOFTPLC.EXE) is executed. The file format uses three (3) KEY words and demands the channel definition information be placed on a single line and in a particular order. All lines begun with a semicolon are considered comments and are ignored.

The three (3) KEY words are "**PORT**", "**TIMEOUT**" and "**HIGHSPEED**". The PORT address is the address the jumpers are set to on the first Sensoray card. Additional boards are assumed to be mapped at 4 byte sequential offsets above this setting. When the driver initializes, the calculated address will be displayed. The 2nd key word TIMEOUT is used to adjust the internal I/O communication timeout. This is the time in milliseconds that will be allocated for waiting for the Sensoray Board to respond to an I/O Port command. This value may need adjustment if timeout errors (#1019 or #1020) are occurring with an otherwise properly configured system. The adjustment range is 1 to 100 milliseconds. This parameter should be adjusted as small as possible for quick valid error response. The default is 5 milliseconds. The last key word "HIGHSPEED" is used to decrease the channel conversion time and the resolution. The conversion time is 22 milliseconds per channel with 15 bit resolution. Setting HIGHSPEED equal to TRUE will decrease the resolution to 14 bits and decrease the conversion rate to approximately 13 milliseconds per channel. The default is FALSE or high resolution mode.

Each channel used must be defined on a single line in the configuration file. The format is as follows: Board number (0-3), Channel number (0-3), Open Sensory Value (HIGH/LOW), Filter Value (0-255), Sensor Type Code (Hex code from Sensor Table in Sensoray Manual), 3 Custom values for sensor types 0Ch and 12h only. All undefined channels will be automatically set as a disabled channel (type 13h) to decrease the channel scan rate.

Configuration File example: (SR518.CFG)

```
PORT=2B0           ;Start Port Address in HEX for Board #0
TIMEOUT=10        ;Default is 5 milliseconds
HIGHSPEED=TRUE    ;Default is FALSE
```

```
;-- REQUIRED FIELDS --><-- CODE DEPENDENT -->
;B#,CH#,OPEN,FILF,COF, ACOF, BCOF, CCOF
 0, 0,HIGH, 0, 0F, 100, 200, 300 ;Gage
 0, 1,HIGH, 0, 0C, 1, 17, -3105 ;Custom
 0, 2,HIGH, 0, 17
 0, 3,HIGH, 0, 16
 0, 4, LOW, 0, 15
 0, 5, LOW, 0, 0A
 0, 6, LOW, 0, 14
 0, 7, LOW, 0, 20
```

```
;Note: Second Board will start at Port 2B4h
 1, 0, LOW, 0, 0F, 100, 200, 300 ;Gage
 1, 1, LOW, 0, 0C, 1, 17, -3105 ;Custom
 2, 0, LOW, 0, 17
 2, 1, LOW, 0, 16
 3, 3, LOW, 0, 15
```

III. RUNTIME TLI'S PROVIDED

The following TLI's can be programmed using TOPDOC for SoftPLC (TDZ).

- STATUS** - Reads the Status Register for the selected board. Useful to detect possible coprocessor fault or active alarm condition.

parm1: Board - Board number 0-3.
parm2: Data - Status Register (byte). Bit Definitions:
b0 = Not Used
b1 = Not Used
b2 = Not Used
b3 = Not Used
b4 = Reset in progress or Board Fault detected
b5 = Channel Alarm Sounding
b6 = Data Available; Ready to be read
b7 = Cmd Register Empty; Ready to receive
- SETALARMLIMITS** - Sets HIGH and LOW Alarm limits for a specified channel.
parm1: Board - Board number 0-3.
parm2: Channel - Channel number 0-7.
parm3: Low - Low alarm value.
parm4: High - High alarm value.
parm5: Error - Error Code.

3. **READALARMFLAGS** - Reads HIGH and LOW Alarm flags. (1=on,0=off)
 - parm1: Board - Board number 0-3.
 - parm2: Status - High Flags (b15-b8), Low Flags (b7-b0).
 - parm3: Error - Error Code.

4. **READBOARDTEMP** - Reads board temperature to .1 Degree C.
 - parm1: Board - Board number 0-3.
 - parm2: Temp - Board Temperature times 10.
 - parm3: Error - Error Code.

5. **READCHANNEL** - Reads a single channel's data; non-scaled.
 - parm1: Board - Board number 0-3.
 - parm2: Channel - Channel number 0-7.
 - parm3: Data - Where to put channel data value.
 - parm4: Error - Error Code

6. **READALLCHANNELS** - Reads all eight (8) channels weather activated or not.

This function must be called via a timer contact approximately every 22ms times the number of channels activated. For example, if all eight (8) channels are activated then this TLI should be called not less than every 176 ms (22x8). The data read will need to be scaled in your ladder program as defined in the Sensor Tables in the "Sensoray Instruction Manual". All channel values read from the board are non-scaled. De-activated channels data will be undefined.

 - parm1: Board - Board number 0-3.
 - parm2: Data - File address; where to put the eight data values.
 - parm3: Error - Error Code

7. **TAREGAGE** - Compensates strain/pressure gage for container weight or an imbalance in the gage bridge circuit. This function should be called with a permissive that remains TRUE once per TARE request. Only works for Gage sensor type 0Fh.
 - parm1: Board - Board number 0-3.
 - parm2: Channel - Channel number 0-7.
 - parm3: Error - Error Code.

8. **SETGAGEZERO** - This command sets the zero-load value on a strain gage channel. In effect, it tells the Model 518 that there is no load on the channel load cell. Typically, this command is issued just prior to a SetGageSpan command.
 - parm1: Board - Board number 0-3.
 - parm2: Channel - Channel number 0-7.
 - parm3: Error - Error Code.

9. **SETGAGEZERO** - This command sets the effective gain of a strain gage channel. To utilize this command, switch the zero-load signal onto the channel and issue the SetGageZero command. Next, switch the full-load signal onto the channel and issue the SetGageSpan command.

parm1: Board - Board number 0-3.
parm2: Channel - Channel number 0-7.
parm3: Error - Error Code.

10. **READGAGECALIB** - This command returns the internal slope and offset from a strain gage channel. The response string is 6 bytes or 3 words long. The first 4 bytes or 2 words contain the gage slope, encoded in the floating point format used internally by the coprocessor. The last two response bytes or word contain the lumped gage offset, representing a 2's complement integer. This lumped gage offset consists of the present tare offset combined with bridge and coprocessor circuit offsets. In order for the response values to be valid, the strain gage must have been calibrated using the SetGageZero and SetGageSpan commands or using the SetGageCalib command.

parm1: Board - Board number 0-3.
parm2: Channel - Channel number 0-7.
Parm3: Data - File address of 3 word calibration array
parm4: Error - Error Code.

11. **SETGAGECALIB** - This command transfers strain gage slope, and offset parameters to the coprocessor for a specific strain gage channel. Typically, these parameters will have been previously obtained via execution of the ReadGageCalib command. A 500 millisecond delay is required between execution of the SetGageCalib and ReadGageCalib commands.

parm1: Board - Board number 0-3.
parm2: Channel - Channel number 0-7.
Parm3: Data - File address of 3 word calibration array
parm4: Error - Error Code.

IV. INSTALLATION

The **SR518 TLM** should be installed on *SoftPLC*'s Flash Disk in the \SPLCZ directory.

The SR518 driver is loaded by *SoftPLC* via it's "MODULE.LST" file. In any case, the MODULE.LST file must be located in the default directory where the *SoftPLC* kernel is executed.

The "MODULE.LST" should include the following statement.

DRIVER=C:\SPLCZ\SR518.TLM

The SR518 driver configuration file (SR518.CFG) must also be located in the default directory position where *SoftPLC* is executed. If the start-up directory is C:\SPLCZ, then the SR518.CFG file must also be located in this directory. The SR518 driver assumes the configuration file is in the current directory; where the system is left when *SoftPLC* is started.

For off-line programming, a "MODULE.LST" file must also be provided. In this case it must reside in the TDZ directory (\TDZ). Since no I/O scanning is performed in *TOPDOC*, the keyword "MODULE" can be used instead of DRIVER and the configuration file is not required. For example:

MODULE=C:\TDZ\MODULE=SR518.TLM

V. CALIBRATION PROGRAM

The DOS based program "**CAL518.EXE**" is provide to calibrate the coprocessor internal standards. All measurements made by the coprocessor are referenced to these standards. To perform a board calibration, you must supply two (2) reference voltages (5 volts and 500 millivolts) and a reference resistance (380-400 ohms).

References must be calibrated in the following order: 5 volt, 500 millivolts, and 380 ohms. The *CAL518* program will prompt you to enter the actual measured value of the standard at each phase of the calibration.

VI. POSSIBLE ERROR CODES

- 1000 - Incompatible *SoftPLC* version
- 1001 - Illegal number of Racks
- 1002 - Bad Kernel command

- 1011 - Unable to Open the Configuration File (SR518.CFG)
- 1012 - Invalid Port Address (00-3F0h only)
- 1013 - Incomplete Configuration File Entry
- 1014 - Invalid Channel Number
- 1015 - Invalid Filter Value
- 1016 - Invalid Sensor Type
- 1017 - Invalid Board Number
- 1018 - Invalid Alarm Limits
- 1019 - Port Write Timeout
- 1020 - Port Read Timeout
- 1021 - Fault Detected
- 1022 - Invalid Product ID
- 1023 - Invalid Calibration Actual Value Given