Solartron Metrology
AMETEK

Compass SCD1 & SC1

USER LEAFLET

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2. General

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3. Introduction

This document specifies the function and performance of the Solartron Metrology Single Conditioning Unit Channel SC1 (no display) and SCD1 (with 6-digit, 7 segment display).

The Solartron Metrology Conditioning Unit Single Channel has a 5-pin DIN female socket to connect to the AX range of Calibrated LVDT or half bridge sensors. A female 9 pin D-type connector outputs Modbus data (RS485) and Analog voltage (±10 V 16 bit).

There is a USB C type socket, to power the device and communicate using USB. The USB socket is used to configure the unit and /or to read back data. The amplifier can be configured and calibrated with the sensor using the "SCD1_CalConfig" utility. This can be found within the "Orbit3 Suite".
The sensor can be conveniently read from the USB port using the Gauge Computer Software (Orbit GCS). GCS also offers mathematical functions and data logging to be performed on the sensor. Orbit GCS can be found within the Orbit3 Suite. Alternatively, the sensor can be read from the USB port using serial commands, see section 7 for further details".

SAFETY SUMMARY

Products with their own manuals may contain additional safety information.

WARNING statements identify conditions or practices that could result in personal injury or loss of life. **CAUTION** statements identify conditions or practices that could result in damage to the equipment or other property Symbols in this manual  Indicates cautionary or other information	**Warnings and Cautions** **Warning:** Do not operate in an explosive atmosphere. **Warning:** this equipment is not intended for safety critical applications **Warning:** do not exceed maximum ratings as specified in this document. Caution: Low Voltage This equipment operates below the SELV and is therefore outside the scope of the Low Voltage Directive Service and Repair  **CAUTION**: This equipment contains no user serviceable parts. Return to supplier for all service and repair

4. Electrical Installation

4.1. Electrical connections

The SC1 / SCD1 has:

- Probe (Sensor) Connector – a 5-pin DIN female socket for sensor LVDT or half bridge (HB). Note that during Calibration & Configuration, the type is autodetected. Refer to Probes
- USB type C. This is the main interface for power and communicating with the product. When connected to Windows, it enumerates to a virtual COM Port, which allows serial communications to take place – refer to Communicating with SC(D)1.

  The unit is powered from USB type C (5 V ±10 %) either a PC or simple USB C charger block.
- Output Connector – a 9 Way 'D' type connector (socket) for analogue outputs and MODBUS RTU connections

4.2. Output Connector

The outputs are connected via the 9-way D-type socket.

Pin Number	Description
1	MODBUS (RS485B)
2	MODBUS (RS485A)
3	NOT CONNECTED
4	NOT CONNECTED
5	0V
6	NOT CONNECTED
7	NOT CONNECTED
8	NOT CONNECTED
9	VOUT (ANALOGUE -10 TO +10 V 16 bit DAC)

5. Mechanical Installation

The SC1, SCD1 may be DIN rail, 35 mm, mounted or freestanding.

5.1. Environmental

Indoor use; altitude up to 2 000 m; temperature 5 °C to 60 °C; maximum relative humidity 80 % for temperatures up to 31 °C decreasing linearly to 50 % non-condensing.
Degree of ingress protection: IP30.

6. Features

6.1. Communicating with SC(D)1

The SC(D)1 can be externally accessed via:

- A serial protocol (using a virtual COM port) using the USB connection – refer to USB Serial Interface
- "Orbit GCS" (part of the Orbit3 Suite) offers an easy way of displaying the sensor position, perform mathematical functions and record data onto a windows PC. Refer to Orbit Compatibility
- The "SCD1-A Cal Config Utility" (part of the Orbit3 Suite) offers an easy way of calibrating a sensor. It also offers an easy way to set the filtering of the readings, set the high and low limits, setup the MODBUS protocol and units, set the number of displayed digits (SCD-1) and set the analogue output type (digital levels or analogue). Refer to Calibration & Configuration
    -
- Via the Modbus RTU interface
    - Reading only

6.2. Setting up Probes

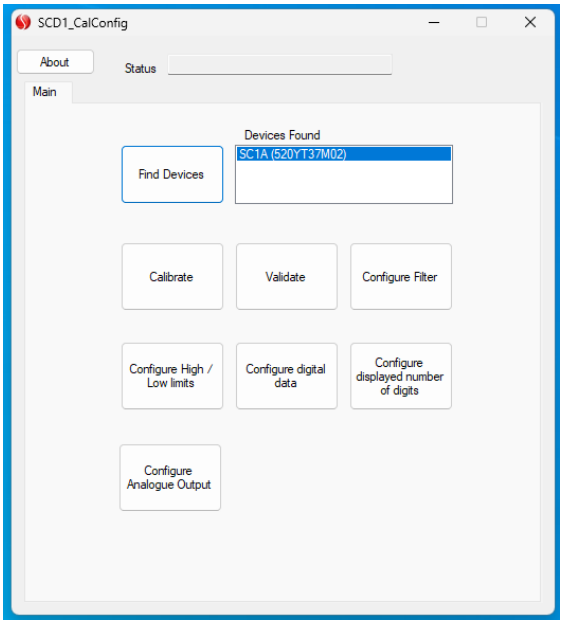
This section describes how to connect the unit.

6.2.1. Calibration & Configuration

- Plug AX probe either LVDT or Half bridge into the 5 pin DIN.

- Connect to a PC with Orbit suite loaded via the USB-C connector.
  (This is required to configure and power the unit. After the device has been configured it can be powered from a USB-C power adapter).

- Start Orbit3 Suite
  Orbit3 suite is installed via the Orbit3 Support Pack (520439), which is freely available from Software Driver Download (www.solartronmetrology.com)
- Click the "SCD1-A CalConfig Utility" (511008).



Click **Find Devices**, wait until a list of connected devices is displayed. Select the desired one.

Now select from **Configure digital data**, **Calibrate**, **Validate**, **Configure filter**, **Configure High / Low limits**, **Configure displayed number of digits** or **Configure Analogue outputs**.
(This is stored in non-volatile memory and can be changed any time as required).

Described in more detail below:-

6.2.1.1.Configure Digital Data

Click “Configure digital data” to select from mm, inches or mil (thousands of inch) then click finish.

Modbus (if required).

Set the Modbus baud rate: 4800, 9600, 19200, 38400, 57600, or 115200.

Set the Modbus Node ID number (server): 1 to 247.

Modbus parity: none, even or odd.

6.2.1.2.Calibration

LVDT or Half bridge should be selected from radio buttons. Note: sensor must be fully in or out for this to function correctly.
Select the frequency from the pull-down list (3.8, 5, 7.5, 10, 13, 20 kHz). If the sensor is a half bridge type then the half bridge Load (1 K or 2 K can be selected).
The sensor parameters (frequency and load) can be found in the sensor data sheet. If this is not available, select a frequency of 10 kHz and if a load option is given select 2 K.

Follow the on-screen instructions.

6.2.1.3.Validate

This allows Centre, fully out / in to be verified / validated.

6.2.1.4.Configure Filter

Select the filtering Minimum (~1Hz), medium (~5 Hz) or max (~35 Hz) or user adjustable.
Enter total measurement length.

6.2.1.5.Configure High / Low Limits

Sensor Lower Limit Click **set** and enter value and click ok. Repeat for Sensor upper limit.
The current sensor position is shown together with the Go / NoGo limits.

6.2.1.6.Configure displayed number of digits

SCD1 only. Select 1, 2, 3 or 4.

6.2.1.7.Configure Analogue Outputs

This allows easy set-up of the Analogue Output and its options.

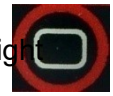
6.3. LEDs

The two bi-colour LEDs indicate:

LED	Green	Red
Status (left)	SC(D)1 set up**	SC(D)1 not set up
Measurement (right)	In limits	Outside limits

** set-up means that the SC(D)1 has been through the Calibration process.

6.4. Switches (SCD1 only)

Left  Enter  Right 

The SCD1 contains three switches for user control. Their operation is explained in the table below:

Set datum.	Press ‘Left’ and ‘Right’ keys together and keep them pressed.
	When the display clears and shows ‘**dAt**’ release the keys. The display will show ‘ **dAt** ‘ for 1 second, then display will show the zeroed sensor position.
	Readings now referenced to new zero Datum.
Unset datum.	Press ‘Left’ and ‘Right’ together and keep them pressed.
	After a second the display will clear and show ‘**dAt**’ for 1 second, after a further second the display will show ‘ **clr** ‘, release the keys. The display will show ‘ **clr** ‘ for 1 second, then display will show the probe position with no datum offset.
	Readings are now set to the sensor position.
Set Limits.	Move the probe to the desired upper limit.
	Press ‘Right’. Hold for 1 second.
	Measurement LED will flash Green twice.
	Move the probe to the desired lower limit.
	Press ‘Left’. Hold for 1 second.
	Measurement LED will flash green twice.
	Limits are now set.
Set display number of decimal places.	Press ‘Enter’ and hold for 1 second.
	After 1 second the display will flash “**0.00000**”.
	Release the ‘Enter’ key.

	Press and hold ‘Left’ to reduce the number of decimal places by one (display will reduce to show ‘**0.0000**’, then ‘**0.000**’, then ‘**0.00**’ then “**0.0**”. The lower limit is one decimal place.
	Press and hold ‘Right’ to increase the number of decimal places by one (display increase to show ‘**0.00**’, then ‘**0.000**’, then ‘**0.0000**’ then ‘**0.00000**’. The upper limit is five decimal places.
	Press the ‘Enter’ key to set the number of decimal places.

6.5. Modbus RTU

This device has Modbus RTU capability to allow reading to be obtained. Note: RTU = Remote Terminal Unit.

6.5.1. Modbus Hardware

This uses an RS485 half-duplex style communications interface. Operating in Client/Server mode.

6.5.2. Modbus Settings

Node ID, the address of SC1 on the Modbus network for master device (PLC), by default is set to address 1. This can be set to user preferred address via the Calibration & Configuration utility software (see Configure Digital Data). Also, the baud rate & parity can be set using same method.

6.5.3. Modbus Communications

Supported MODBUS function codes / commands:

- READ_REGISTER
- READ_INPUT_REGISTERS

The following commands are implemented (potentially for future use and completeness), but at the moment are not in use, as no address is available for user to write via Modbus. These commands can be activated by defining the MODBUS_WRITE_FUNCTIONS.

- WRITE_MULTIPLE_REGISTERS
- WRITE_SINGLE_REGISTER

Unsupported commands:

- READ_BIT
- WRITE_BIT
- LOOPBACK_COMMAND

6.5.4. Modbus parameter Map

Currently only 2 addresses on the parameter map are available for user to be read via Modbus read command.

Modbus Register Start Address	Parameter on the SC1 data map	Application on Modbus interface	Number of Modbus Registers Required	Data Type
0	SC1_DATA_FIELD_UOM	Returns the current Units Of Measure (UOM)	1	Enum (Uint8)
1	SC1_DATA_FIELD_PROBE_READING_UOM	Returns reading in the current Units Of Measure (UOM)	2	Int32

6.6. Analogue Output

Two modes are available:

Mode	Functionality	Details
Reading	An analogue voltage (16 bit resolution). Two ranges: -10 to +10 volts (16 bit DAC) proportional to the sensor position. Or 0 to +10 volts proportional to the sensor.	For Example, a ±5 mm sensor: • -5 mm => -10 V • 0 mm => 0 V • +5 mm => +10 V Note output slew rate will depend on the amount of filtering applied
Limit Logic	'digital output' that reflects the limits status. User selectable voltages for inside & outside limits	The "Out of limit" status level can be adjusted from -10 to +10 V. The "In limit" status voltage can be adjusted from -10 to +10 V.

.

Also, set via the Utility – Configure Analogue Outputs. Also, see Output Function

6.7. Probe readings

After Calibration & Configuration, the probe can be read by:

- The 7 segment display on SCD1
- Via the USB Serial Interface
- Via the Orbit Library
- Via the Modbus RTU Interface

7. Settings / Data Map

At its heart, the SC(D)1 has a parameter (or data) map that contains all settings and readings. This unit has many settings. The Calibration & Configuration Utility software is designed to adjust common user settings more easily & to avoid having to:

- Manually set-up the probe & functionality.
- Using the data map at all

Each individual setting is assigned a parameter number and a value. Some parameters are read-only, some are non-volatile (EEPROM) and some are reserved for Solartron use. This map can be used to:

- Configure the SC(D)1
- Obtain Readings

These parameters can be read / written to via the ReadSetting / WriteSetting USB Serial commands.

The table, next, lists all of the available parameters:

#	Name	Type	Non Vol	Read Only	Default	Details
2	Product Type	enum	Y	Y	0	None = 0, SC1-A = 1, SCD1-A = 2
4	Firmware Version	String(5)	N	Y	V1.00	
5	Orbit Identity (Serial Number)	String(10)	Y	Y	**********	e.g. PPPBYWWNXX
6	Part Number	String(12)	Y	Y	Blank	e.g. 97XXXX
16	UOM	enum	Y	N	mm	See Units Of Measure (UOM) Also, set via the Utility – Configure Digital Data
17	Lower Limit	sInt32	Y	N	0	Limit in Units Of Measure (UOM) Also, set via the Utility – Configure High / Low Limits Note that this can also be altered using the Switches (SCD1 only)
18	Upper Limit	sInt32	Y	N	0	Limit in Units Of Measure (UOM) Also, set via the Utility – Configure High / Low Limits Note that this can also be altered using the Switches (SCD1 only)
19	Number of Decimal Places	uInt8	Y	N	4	Number of DPs shown on display Also, set via the Utility – Configure displayed number of digits Note that this can also be altered using the Switches (SCD1 only)

24	Output Filtering	uInt16	Y	N	200	Number of averaging of main reading. Also, set via the Utility – see Configure Filter. Min = 1 (no averaging), Max = 999. Notes • Setting above 300 will reduce practical reading speed / update rate. • Setting = 300 gives a step response of 700msec. and is the recommended upper limit.
25	Baud Rate	enum	Y	N	115200	Baud rate for Modbus / serial comms Also, set via the Utility – Configure Digital Data
26	Serial Stream Rate	uInt8	Y	N	100	Delay between streamed readings in milliseconds. Min = 10
27	Streaming	uInt8	N	N	1	See Streaming
28	Reading Format	enum	Y	N	-	See Streaming
30	Reading in mm	sInt32	N	Y	-	Reading expressed in mm () See Probe Readings
31	Reading in UOM	sInt32	N	Y	-	Reading expressed in Units Of Measure (UOM) See Probe Readings
32	Reading in mm_String	String[10]	N	Y	-	Reading expressed in mm as a string (as displayed on the SCD1 display)
34	Reading Limit Status	enum	N	Y	-	Status of reading compared to Upper & Lower Limits: See Limit Status
36	Reading in UOM Zero	sInt32	Y	Y	-	Reading zero offset in Units Of Measure (UOM)
37	Reading Mode	enum	N	N	None	See Reading Mode Note that this can also be altered using the Switches (SCD1 only)
45	Display Override Enable	uInt8	N	N	0	See Display Override
46	Display Override String	String[10]	N	N	-	See Display Override
54	Analogue Out Function	enum	Y	N	Reading	Sets the Analogue Output Function
55	Logic High Voltage	short	Y	N	5000	Sets the Analogue Output Function logic HIGH level in mV

56	Logic Low Voltage	short	Y	N	0	Sets the Analogue Output Function logic LOW level in mV
57	Modbus Node ID	uInt8	Y	N	1	NodeID or SlaveID, the address of the SC1 as a node on Modbus network. Also, set via the Utility – Configure Digital Data
58	Modbus Parity Type	uInt8	Y	N	0 (None)	None(0), Odd(1), Even(2) Also, set via the Utility – Configure Digital Data
60	Probe reading direction	enum	Y	N	0 (retract+)	See Probe reading direction
61	Probe Stroke In Microns	uInt32	Y	Y		Stroke in um (e.g. 20,000 => 20mm)

7.1. Units Of Measure (UOM)

In order to represent the reading in the desired Unit Of Measure, the following options are available:

Value	UOM	Details
0	UNKNOWN_NA	SC1 does not recognise the UOM
1	mm	Millimetres selected. Readings returned in Implied 6 Decimal Places
2-5	Reserved	
6	Inch	Inches selected. Readings returned in Implied 6 Decimal Places
7-9	Reserved	
10	Mil	mils selected. Readings returned in Implied 5 Decimal Places

7.2. Reading Mode

The reading can be zeroed or not (absolute). The following modes are available.

Value	Reading Mode	Details
0	`readModeNone`	SC1 does not recognise the reading mode.
1	`readModeZero`	The SC(D)1 reading has already been zeroed. Use parameter 'Reading in UOM Zero' to obtain actual zero offset. Note that this can also be achieved using the Switches (SCD1 only).
2	`readModeAbsolute`	The SC(D)1 reading is **NOT** zeroed – parameter 'Reading in UOM Zero' is set to zero.

		Note that this can also be achieved using the Switches (SCD1 only).
3	`readModeZero_Applying`	Set this to request to zero the to the present reading. Value will alter to `readModeZero` when complete. Note that this can also be achieved using the Switches (SCD1 only).
4	`readModeAbsolute_Applying`	Set this to request to remove the zero from the reading. Value will alter to `readModeAbsolute` when complete. Note that this can also be achieved using the Switches (SCD1 only).

7.3. Probe Readings

Probe readings can be obtained in 2 ways:

7.3.1. Via the DataMap - see Settings / Data Map

Readings are sent on request

Parameter – see Settings / Data Map	Details
Reading 18 bit	Returns reading in counts (Solartron only)
Reading in mm,	Returns reading in millimetres - see Units Of Measure (UOM) as an integer with implied decimal places
Reading in UOM	Returns reading in the current Units Of Measure (UOM) as an integer with implied decimal places

Note that these readings are sent in binary format.

7.3.2. Via the USB Command Protocol

Readings are streamed or on request.

Command – see Supported Commands	Details
GetReading	Returns a reading in Reading format
StartStreaming	Start streaming (at the serial stream rate)
StopStreaming	Stops streaming

Note that these readings are sent in ASCII format.

Parameter – see Settings / Data Map	Details

Streaming	0=> stream, Non zero => Do not stream **NOT** stored in non-vol
Serial Stream Rate	Delay between streamed readings in milliseconds

7.4. Using integers with implied decimal places

To avoid using floating point maths, a 32 bit signed integer is used to represent a binary number with a decimal place – e.g. the reading in Units Of Measure (UOM).

7.4.1. Implied 6 Decimal Places

In most cases, this is represented as a 6 decimal place integer, i.e. 1,000,000 => 1.000000

7.4.2. Implied 5 Decimal Places

However, in certain cases (for larger numbers that would overflow the 32 bit boundary e.g. mils), this uses a 5 decimal place integer, i.e. 100,000 => 1.00000

7.5. Limit Status

When Upper & Lower limits are in use, limit status has the following possible values:

Value	Reading Mode	Details
0	`None`	SC(D)1 does not recognise the limits set.
1	`LessThan`	Reading is inside limits
2	`Between`	Not used by SC(D)1
3	`Greater Than`	Reading is outside limits
4	`Out Of Range`	Not used by SC(D)1
5	`Error`	Not used by SC(D)1

7.6. Output Function

The Analogue Output has various modes, defined in the AnalogueOutFunction Setting. This has the following functionality:

Function / Mode	Name	Description
0	Reading -10 to 10V	Normal operation of firmware. Analogue output (+ / - 10 V) over the calibrated reading range
1	Limits Logic	Output goes high (V_{LH}) outside limits, low (V_{LL}) inside limits
2	Reading 0 to 10V	Analogue output (0 to 10 V) over the calibrated reading range

7.6.1. Reading

This will output the reading scaled to either:

- ±10 V output
- 0 to 10 V output

Note that the slew rate will depend on the Output Filtering Setting

7.6.2. Limits Logic

Two Settings are available for

- Logic High Voltage (V_{LH}). This can be set to any voltage (in mV) between ±10 V
- Logic Low Voltage (V_{LL}). This can be set to any voltage (in mV) between ±10 V

e.g. for 5V, Active high, V_{LH} = 5000, V_{LL} = 0

e.g. for 3.3V, Active low, V_{LH} = 0, V_{LL} = 3300

7.7. Output Filtering

This setting averages readings. The more the reading is averaged over, the slower the reading speed becomes. More averaging will provide a more stable reading, but will lead to a slower update / response rate.

Minimal averaging provides a faster response time, but more 'jitter' on readings. The user can vary the amount of filtering to suit their application.

7.8. Probe reading direction

The reading can operate in 2 directions from the Probe Direction setting:

Value	Reading Mode	Details
0	`RetractPlus`	The SC(D)1 reading will increase as the probe tip is ***retracted*** (i.e. probe fully out to fully in = positive)
1	`ExtendPlus`	The SC(D)1 reading will increase as the probe tip is ***extended*** (i.e. probe fully in to fully out = positive)

Note that the analogue output will also be affected by this.

8. USB Serial Interface

The USB / serial protocol relies on Windows ***assigning*** a virtual COM port for the SC(D)1 to the user. Other operating systems (e.g. Linux) ***should*** operate in a similar manner (but this has not been tested recently).

The serial protocol accesses various parameters (see Settings / Data Map) from the SC1. Certain parameters are reserved for Solartron use only and are not accessible to the customer.

In normal mode, the SC1's USB interface (endpoint) is able to send / receive 64 byte command / replies. It is configured as a USB UART (CDC) configuration, operating at Full Speed (12Mbit).

Once communications are established (see Identifying a SC(D)1), communications can be undertaken in 2 ways:

- Send Commands & their reply
- Stream Readings

8.1. Commands

8.1.1. Command Protocol

- All commands start with a '^' (ASCII)
  - Followed by a command byte (binary)
  - Followed by the Address byte (binary)
- All command replies start with a '>' (ASCII)

8.1.2. Supported Commands

Command	Send	Receive	Details
WriteSetting	Parameter# + Value to write	Acknowledge	Writes a setting to a parameter
ReadSetting	Parameter#	Value Read	Reads a setting for a parameter
GetReading		Reading	Requests a single reading
StartStreaming		Acknowledge	Starts the SC1 streaming readings
StopStreaming		Acknowledge	Stops the SC1 streaming readings

8.1.2.1.WriteSetting

- WriteSetting(Number of bytes, Address byte, enum eSettings, Value)
  - Command 'W'
  - Writes a Setting to the Data Map
  - Includes an 8 bit Checksum
  - example: to write Setting <*Setting*> to <*Value*>,
    - Length = N bytes in total for a N byte value
    - Send:
      '^', 'W', Address byte, Length, <*Setting*>, <*Value*>, <Checksum>
      For example: To Write the "Output Filtering" (data map index = 24, 2 bytes) to 100, open the serial port and using suitable terminal read / write software send: "^W\x01\x02\x18\x64\x00\xCC".
      - Where \x indicates a hexadecimal number
      - Address = \x01
      - Length = \x02
      - Data Map setting = \x18 = 24
      - Value = 2 bytes (LSB first) = \x64 \x00
      - Checksum = \xCC

- Returns '>', <*Status*>. Where <*Status*>
  - <*Status*> = Error Code

8.1.2.2.ReadSetting

- ReadSetting(Address byte, enum eSettings, Read Value)
  - Command 'R' (ASCII)
  - Reads a Setting from the Data Map
  - Includes an 8 bit Checksum
    - E.g. to read Setting <*Setting*> to <*Value*>,
    - Length = 3 bytes in total.
    - Send:
      - '^', "'R', Address byte, <*Setting*>
      - For example: To read back the FW version open the serial port and using suitable terminal read / write software send: "^R\x01\x04".
        - Where *x* indicates a hexadecimal number
        - Remember to set the serial port to the correct Baud rate. The default is 115200.
  - Returns
    - '>', <*Status*>*, N,* <*Value*>*,* Checksum. Where:
      - <*Status*> = Error Code
      - N = Number of byte for <*Value*>
      - <*Value*> is the setting requested

8.1.2.3.GetReading

- Command 'G'
- Returns data in Reading format
- Send:'^', Address byte, 'G',
- Reply: '>', <*Status*>, <Number of Bytes>, Data

8.1.2.4.StartStreaming

- Command 'S'
- Starts returning readings in in Reading format at Serial Stream Rate
- Send:'^', "'S', Address byte
- Reply: '>', <*Status*>.

8.1.2.5.StopStreaming

- Command 'T'
- Send: '^', "'T', Address byte
- Reply: '>', <*Status*>.

8.1.3. Other Detail

8.1.3.1.Checksum

This is an 8 bit (byte) 2's complement checksum = Complement(∑ bytes) + 1;

This is used to provide validation of data when reading a setting (ReadSetting) or Writing a setting (WriteSetting)

For example, using the example for WriteSetting:

To Write the "Output Filtering" (data map index = 24, 2 bytes) to 100, send:

^W\x01\x02\x18\x64\x00\xCC".

- Where *x* indicates a hexadecimal number

- ^W in hexadecimal = \x5E\x57
- Address = \x01
- Length = \x02
- Data Map setting = \x18 = 24
- Value = 2 bytes (LSB first) = \x64 \x00
- Checksum calculated = \xCC

8.1.3.1.1.Detail

Sum of all bytes = \x5E + \x57 + \x01 + \x02 + \x18 + \x64 + \x00 = \x134
8 bit Complement (NOT) of \x134 = \xCC

8.1.3.2.Error Code

The SC(D)1 returns an error code via USB communications – see USB Serial Interface Commands. This has the following meaning:

- 0 => No error
- 1=> invalid Parameter

  The requested command parameter is invalid (e.g. incorrect data map setting selected)

- 2=> Access Denied
  The requested command is not allowed (e.g. writing to a read only parameter)
- 3=> Hardware error
- 4=> Hardware error
- 5=> Hardware error

8.1.3.3.Address

This is the binary address (0 to 255) that the 'module' to communicates to. Note that:

- For the SC1-A and SCD1-A, there is only one address (address 1).
- Reserved for future versions that support multiple modules,

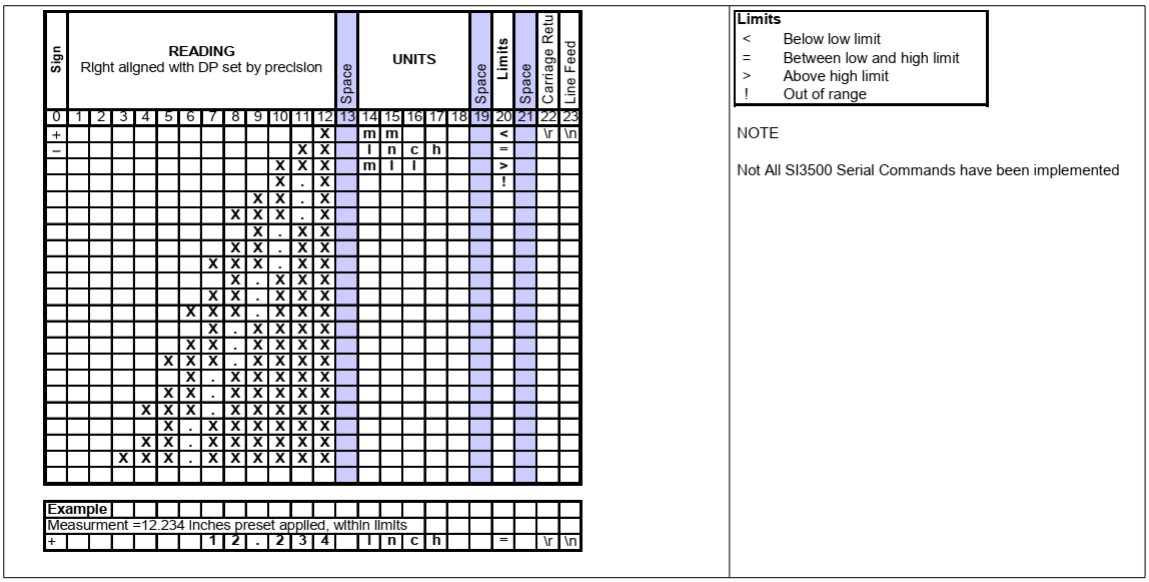
8.1.3.4.Reading format

When a reading is requested, it is returned in an ASCII format. If Binary format is desired, the data map should be read – see Probe Readings via the DataMap

8.1.3.4.1.SI3500

The reading format is designed to be the same as the Solartron SI3500 readout and Orbit ACS (for further information, see ACS manual (503110), section 15.2 - SI3500 COMPATIBILITY PROTOCOL)

Data is sent back as a constant length packet in ASCII format:



8.2. Identifying a SC(D)1

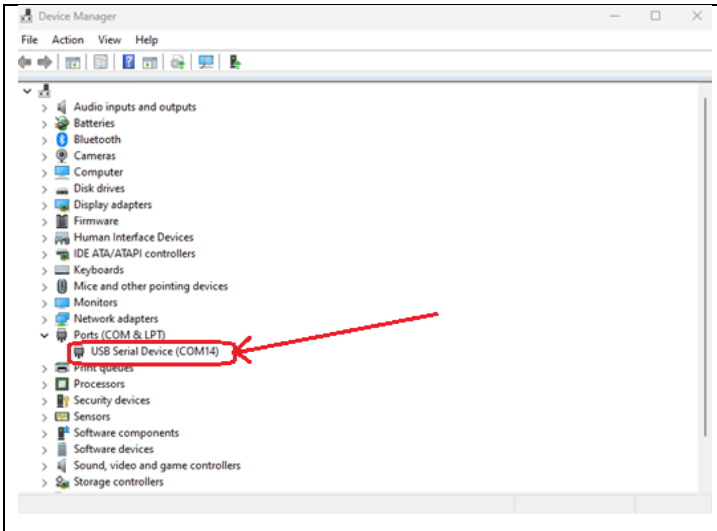
The SC(D)1 devices appear as a virtual COM port.

In order to detect a device (and therefore detect the Com port assigned), two items are checked:

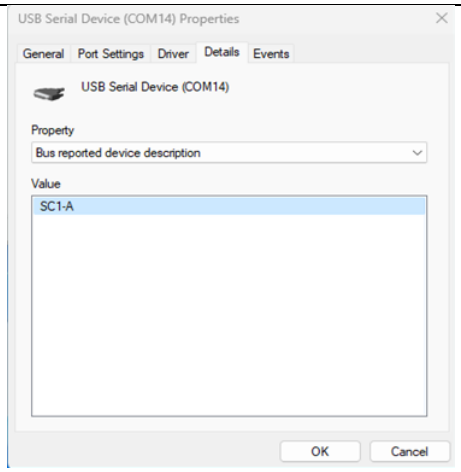
- Device is a USB com port
- Device has the correct 'Bus reported USB device description' – "SC1-A" or "SCD1-A"
  - In Windows software, the Win32 Device Management object can be used to interrogate this

If these two items are valid, then serial commands can then be applied to attempt communications using the Command Protocol.

On Windows OS, the SC(D)1 shows up in 'Device Manager' as shown, next.



Example: SC1 appears as COM14



Bus reported USB device description

9. Orbit Compatibility

Orbit software is designed to interface to the SC(D)1A to treat it as a controller with a single module (that is internal to it). The module is manually added (via Ping, Notify etc).

Therefore, the SC(D)1 will be detected by standard Orbit software (e.g. Orbit GCS) and will return readings.

9.1. Orbit Library

The SC(D)1 is detected via the OrbitServer.Connect method. Refer to the Orbit software Manual (502989) for more details concerning using the Orbit Library.

10. Probes

AX/S – Spring Push (0.7 N ~70 gf) ±0.25, ±0.5, ±1, ±1.5, ±2.5, ±5, ±10 mm.

AX/P – Pneumatic Push (0.7 N ~70 gf) ±2.5, ±5, ±10 mm.

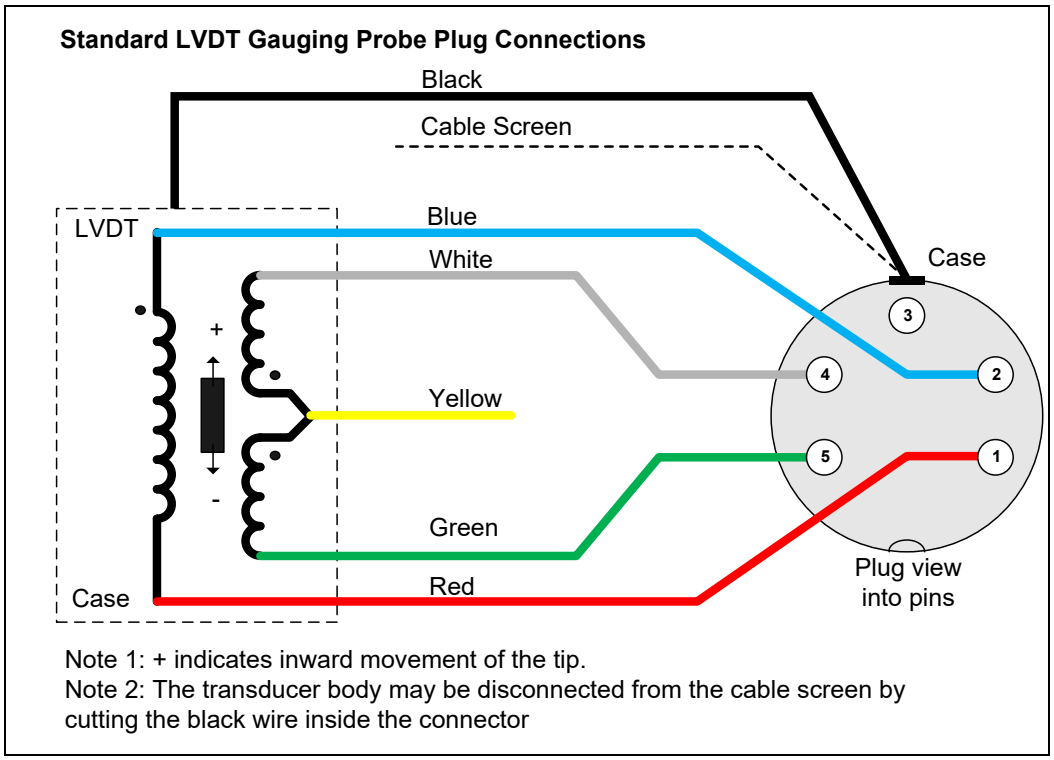
AJ/P – Jet Pneumatic Push ±2.5, ±5, ±10 mm.

AT – Feather touch (0.18N ~18 gf) ±1, ±1.5, ±2.5, ±5, ±10 mm.

AW – Ultra low tip force (0.03N ~3 gf) ±5 mm.

See https://www.solartronmetrology.com/ for more information.

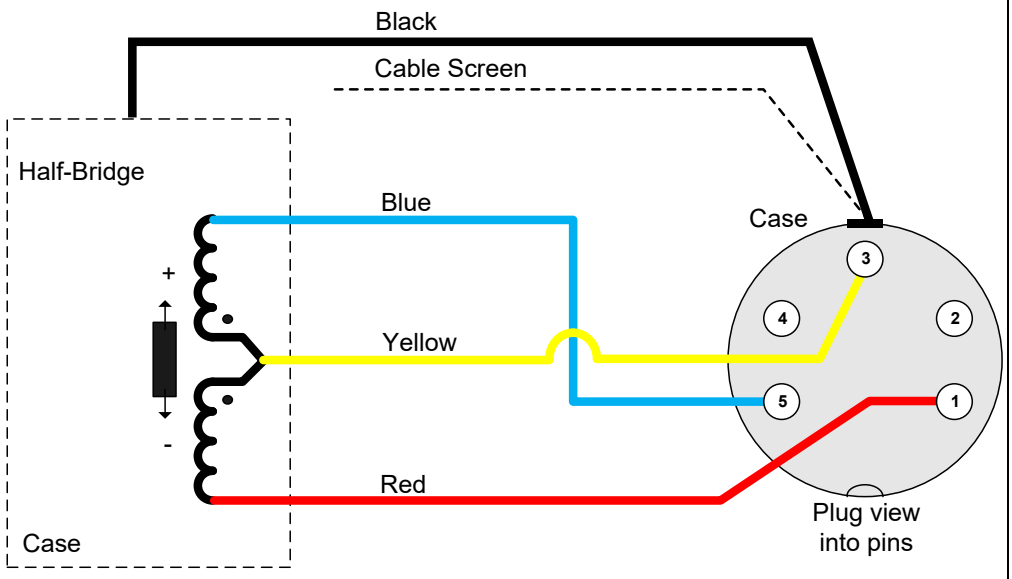
10.1. Transducer Connector LVDT



Note 1: + indicates inward movement of the tip.
Note 2: The transducer body may be disconnected from the cable screen by cutting the black wire inside the connector

10.2. Transducer Connector Half Bridge

Standard Half-Bridge Gauging Probe Plug Connections



Note 1: + indicates inward movement of the tip.
Note 2: The transducer body may be disconnected from the cable screen by cutting the black wire inside the connector

11. Specification

11.1. Approvals (CE, UKCA), and EMC

SC1, and SCD1 are CE, UKCA marked and comply with EN IEC 61326-1:2021; FCC CRF 47 Part 15B:2021 & ICES-003 issue 7:2020.

Parameter	Specification
Probe compatibility.	Calibrated Solartron AX series probes with a 5 pin DIN connector.
Outputs (Visual).	Two Bi-color LED's (Green / Red) for status.
Output resolution (Digital output via USB & Modbus).	18 bits.
Output noise. As measured worst case (near full out position) on a calibrated 10mm Probe.	Raw data (unfiltered) ≈ ±3 µm. Filtered data (192 samples) ≈ ± 0.45 µm.
Output data rate.	800 µsec or slower.
Linearity (%FSO).	<0.02
Mounting.	Free standing or industrial DIN rail.
Power supply.	USB powered (type C USB). Under 100 mA.
Number of probe inputs.	One.
Size.	100 x 45 x 25 mm.
Thermal drift	0.08 µm/°C

12. Abbreviations

- DAC Digital to Analogue converter
- FSO Full Scale Output
- GCS Gauge Computer Software
- LVDT Linear Variable Differential Transformer
- RTU Remote Terminal Unit
- USB Universal Serial Bus

13. WEEE Directive

(Waste Electrical and Electronic Equipment).

To reduce risk of life expired products being misused due to entering unregulated, for example hobby markets, they must be disposed of using professional recycling companies according to local regulations (Directive 2012/19/EU).

14. REVISION HISTORY

REVISION	DATE	COMMENTS
5 – CDCR25200	14/02/2025	Added to Output Filtering in Data Map Setting
4 – CDCR25133	28/08/2024	Improved Table Of Contents.
3 – CDCR25114	17/07/2024	Modified Using integers with implied decimal places
2 – CDCR25071	10/05/2024	Thermal Drift correction
1 – CDCR25071	07/05/2024	Initial Issue