Installation and Calibration Manual BSA

BSA

Basic Switching Amplifier
Installation, Calibration and Maintanance

Standard Version

KST Am Dwarstief 15, 26826 Weener, Germany
+49 (0) 4953 990725, info@kst-systems.de

Preface

About this manual
This manual is a part of the equipment or system, supplied by KST. Keep this manual in a safe place and ensure that it is available to all users.

Liability disclaimer
The content of this manual is subject to change. KST do not provide any guarantee for this material, including the associated guarantee regarding merchantability and suitability for certain intended purposes.
KST accept no liability for errors in the contents of the manual or for direct or indirect damage in connection with the provision and use of the manual.

Trademarks
The usage of common names, trade names, trademarks etc. in this documentation should not be construed to mean that such names, even without special identification, are free in the sense of trademark and trademark protection legislation and hence usable by anyone.

Use for the intended purpose
This device / system is intended exclusively for the tasks described in this manual. Any other use shall be construed as being inappropriate. The manufacturer accepts no liability for damage caused by inappropriate or impermissible use. This device / system may only be used if it is in perfect technical condition.

Qualification of the operating personnel
Only appropriately qualified personnel may work with this device / system, i.e. persons:
- who are familiar with the operation or installation and commissioning
- who know the current regulations for the prevention of accidents

Target groups
This manual addresses:
- System engineers designing machinery and equipment
- Service technicians responsible for installation and maintenance of machinery equipped with electronic control units

Use of other materials
We hereby make express reference to the fact that any parts or accessories not supplied by us have not been tested or released by us. The installation and/or use of such products may therefore have a negative effect on the design properties of your device and thus impair active and/or passive safety. No liability can be accepted for damage caused by the use of spare parts and accessories manufactured by third parties.

KST Am Dwarstief 15, 26826 Weener, Germany
+49 (0) 4953 990725, info@kst-systems.de

Marking of notices

Dangers and other important notices are marked as follows in this system manual:

WARNING
A Warning indicates a hazardous situation which, if not avoided, could result in death or serious injury and gives instructions to take precautions to avert danger.

CAUTION
A Caution indicates a dangerous situation; it also warns of damage to property and gives instructions to avert danger.

IMPORTANT
This message indicates a possibly damaging situation for the product and provides instructions to avoid the possibly damaging situation.

NOTE
Usage instructions and information, supplementary comments and recommendations for the user.but no dangerous situation.

KST Am Dwarstief 15, 26826 Weener, Germany
+49 (0) 4953 990725, info@kst-systems.de

Safety instructions

Follow the instructions in the description. Failure to observe instructions, operation other than for the intended use as described below, wrong installation or incorrect handling can severely impairthe safety of people and the equipment.
The system manual is intended for persons who, on account of their training, experience and the instruction they have received as well as their knowledge of relevant standards, regulations, rules for the prevention of accidents and operating conditions, can be regarded as ‘experts’.
The controller is to be installed and put into operation by technical personnel (programmer or service technician).
Use only the signals specified in the technical data as input via the system connector and only the approved components from KST to extend the system.
The device can be operated within a wide temperature range according to the technical specifications indicated in this manual. Due to the additional self-heating the housing walls can have noticeable high temperatures when touched in hot environments. In the case of malfunctions or uncertainty about usage and specifications, please contact the manufacturer.
Improper handling and misuse can severely impair the safety of people and the equipment, and will lead to the exclusion of liability and loss of warranty.

Danger of electrical short-circuits.
Switch off all systems before commencing with the installation work!

Penetration of water and dirt can damage the device.
Never clean the device with a high pressure cleaner!

Connecting to an unsuitable power supply can cause damage to the device.
The device may only be connected to a DC voltage source of 12 V or 24 V!

The use of components or extensions not approved by the manufacturer can impair system functions and breach radio transmission regulations.
Use components or extensions that are intended and approved by the manufacturer.

KST Am Dwarstief 15, 26826 Weener, Germany
+49 (0) 4953 990725, info@kst-systems.de

Contents

KST Am Dwarstief 15, 26826 Weener, Germany
+49 (0) 4953 990725, info@kst-systems.de

General

The Basic Switching Amplifier (system BSA) is factory-adjusted on request. Should system adjustment be necessary, this can be done as described in this manual.

Tools

- Screwdrivers to open lid and take out PCB and to adjust trimmers and DIP switches
- Digital voltmeter

The supply voltage must be checked first before beginning with adjustment and setting of the BSA basic switching amplifier.

System adjustment installation may only be carried out by KST Customer Service or an authorized representative of KST. Improper adjustment can lead to faulty display of measured values and/or to malfunctions. In such cases, any and all warranty claims shall be voided.

Introduction

The KST basic switching amplifier is suitable for all applications where limit values have to be monitored by one or two sensors, e.g. for measurement of loads, pressures, angles or other measured variables.
In the standard version, the Basic Switching Amplifier is supplied as follows:

- 2 signal inputs for connection of KST sensors with current output **4...20mA**
- Voltage output of **0.5...8 VDC**
- Operating voltage **24 VDC**

Other pre-settings can be done by means of the solderjumpers.

Mechanical Mounting of the BSA Box

- Make sure that the BOX is stable and well fixed mounted on a solid surface.
- The Box MUST always be mounted with the cable glands showing downwards. Be aware that any water, which may have come into the box, nearly always went through cables and cable glands that have not well been fixed and sealed. Be aware that water will lead to malfunctions and eventually destroys the electronic parts inside.

- Only ONE cable per cable gland.
- The cable gland must well be screwed so that the rubber sealing will be tight around the cable
- Avoid a close distance to sources of strong magnetic, electric and electromagnetic fields coming from transformers, power relays, radio transmitter, telephones etc. In case of any doubt, please involve your KST representative

KST Am Dwarstief 15, 26826 Weener, Germany
+49 (0) 4953 990725, info@kst-systems.de

Preparation

BSA is designed to work either in Single Sensor Mode, or in Dual Sensor Mode or in Dual Channel Mode.
The working mode is determined by the settings of Solder Jumpers on the PCB backside.

See APPENDIX C Solderbridges on PCB Backside

Single Sensor Mode

All 3 switchpoints controlled by sensor input 1

Make a wire connection from Terminal X1/6 to X1/4 (see appendix A, Connection Diagram).

Make sure, you have the following settings of solder bridges:
SB 11 OPEN
SB 12 CLOSED
SB 14 CLOSED
SB 15 CLOSED
SB 16 OPEN
SB 17 CLOSED
SB 30 CLOSED
SB 100 OPEN

If the sensor at analog input 1 (Terminal X1/3) is current output type 4…20 mA, then
SB 10 CLOSED

If the sensor at analog input 1 (Terminal X1/3) is voltage output type 1…8V, then
SB 10 OPEN

If switchpoint 3 (controlling relay K3) shall be an Overload switchpoint, then
SB 18 CLOSED
SB 19 OPEN
SB 20 OPEN
SB 21 CLOSED

If switchpoint 3 (controlling relay K3) shall be an Underload switchpoint, then
SB 18 OPEN
SB 19 CLOSED
SB 20 CLOSED
SB 21 OPEN

KST Am Dwarstief 15, 26826 Weener, Germany
+49 (0) 4953 990725, info@kst-systems.de

Dual Sensor Mode

All switchpoints controlled by the sum of sensor 1 + sensor 2

Make sure, you have the following settings of solder bridges:
SB 11 OPEN
SB 12 CLOSED
SB 14 CLOSED
SB 16 OPEN
SB 17 CLOSED
SB 30 CLOSED
SB 100 OPEN

If the sensors at the analog inputs are current output type 4…20 mA, then
SB 10 CLOSED
SB 15 CLOSED

If the sensors at the analog inputs are voltage output type 1…8V, then
SB 10 OPEN
SB 15 OPEN

If switchpoint 3 (controlling relay K3) shall be an Overload switchpoint, then
SB 18 CLOSED
SB 19 OPEN
SB 20 OPEN
SB 21 CLOSED

If switchpoint 3 (controlling relay K3) shall be an Underload switchpoint, then
SB 18 OPEN
SB 19 CLOSED
SB 20 CLOSED
SB 21 OPEN

KST Am Dwarstief 15, 26826 Weener, Germany
+49 (0) 4953 990725, info@kst-systems.de

Dual Channel Mode

Switchpoint 1 controlled by sensor 1
Switchpoint 2 by the sum of sensor 1 + sensor 2
Switchpoint 3 controlled by sensor 2

Make sure, you have the following settings of solder bridges:
SB 11 CLOSED
SB 12 OPEN
SB 14 CLOSED
SB 16 CLOSED
SB 17 OPEN
SB 30 CLOSED
SB 100 OPEN

If the sensors at the analog inputs are current output type 4…20 mA, then
SB 10 CLOSED
SB 15 CLOSED

If the sensors at the analog inputs are voltage output type 1…8V, then
SB 10 OPEN
SB 15 OPEN

If switchpoint 3 (controlling relay K3) shall be an Overload switchpoint, then
SB 18 CLOSED
SB 19 OPEN
SB 20 OPEN
SB 21 CLOSED

If switchpoint 3 (controlling relay K3) shall be an Underload switchpoint, then
SB 18 OPEN
SB 19 CLOSED
SB 20 CLOSED
SB 21 OPEN

KST Am Dwarstief 15, 26826 Weener, Germany
+49 (0) 4953 990725, info@kst-systems.de

Connection and Selection of the Supply Voltage

See Apendices A “Connection Diagram” and C “Solderbridges on PCB Backside”

The switching amplifier is factory-set to a supply voltage of 24 VDC. However, the switching amplifier can also be changed over to an operating voltage of 12VDC (see below).

	Operating voltage				
	+24 V	GND	GND optional	+12V alternatively	
Terminal	X1/1	X1/2	X1/5	X1/2	

For a supply voltage of 24 Volts, leave SB 1 OPEN.
Tolerance of 24V supply voltage is +/- 20%.

If you have a supply voltage of 12 Volts, close SB 1.

Make sure that the supply voltage will NOT exceed +20% and -5%.
Overwrite the 24V on the typeplate with a permanent marker!

Connection of the Sensor(s)

See Apendices A “Connection Diagram” and C “Solderbridges on PCB Backside”

Terminal	Function
X1/3	Analog input, Sensor 1 signal
X1/4	Analog input, Sensor 2 signal
X1/5	GND for both sensors
X1/1	Supply voltage for both sensors, if not done externally

BSA has a factory-setting to sensorsignals of **4...20mA**.
If a sensor with voltage output has to be connected, change the appropriate soldering jumpers (SB10 and SB15 on the backside of the circuit board (see Appendix C).

KST Am Dwarstief 15, 26826 Weener, Germany
+49 (0) 4953 990725, info@kst-systems.de

Relay Outputs

See Apendices A “Connection Diagram” and B “Elements on PCB Upside”

The system has 3 potential free relay outputs that can be used for limit values. Relays K1 and K2 are always overload relays whereas relay K3 can be set to be either overload OR underload cut-out.
All relay outputs are potential changeover contacts that is available at terminals X2/1….X2/9.
The contact rating is **250VAC/6A** and **30VDC/5A**.
The limit values are set using trimmers P1...P3.

The relay contacts MUST be wired in such a way, that the respective machine function is definitely not working, when BSA is powered off. This is given, when the contacts N/O and C/O are used. So that in normal operation all relays are closed and will only drop out either when the relevant preset limit value is exceeded or when a fault occurs.
In the event of a short circuit or break in a sensor cable, all relays will drop out and remain so until the fault has been remedied.

The status of each relay is indicated by a green LED close to the relay and its trimmer potmeter. When the relay is activated (contact N/O connected to C/O), the relevant LED is lit.

Terminal	Function		Limit-value trimmer
X2/1	N/O contact	Overload relay K1	**P 1**
X2/2	CO contact	Overload relay K1	
X2/3	N/C contact	Overload relay K1	
X2/4	N/O contact	Overload relay K2	**P 2**
X2/5	CO contact	Overload relay K2	
X2/6	N/C contact	Overload relay K2	
X2/7	N/O contact	Over/underload relay K3	**P 3**
X2/8	CO contact	Over/underload relay K3	
X2/9	N/C contact	Over/underload relay K3	

Analogue Output

An analogue Output is available at Terminal X2/10. This output is a voltage output 0,5….8 Volts and its value is the average sum of sensor1 and sensor2 voltages.
Sensors with 4..20mA signals are converted to Volts with a 240 Ohms shunt resistor at the inputs. Hence, the voltage at terminal X2/10 is = (I_{in1}(mA)*0,24 + I_{in2}(mA) * 0,24)/2;
For example, 16mA + 10mA at input result in 3,12V. In Single input mode, input 2 gets fixed 4,6mA, thus 1,1V to be considered in the equation above.

Operation / Calibration

Setting the Limit Values / Adjustment of Switchpoints

See Appendix B "Elements on PCB Upside" and C "Solderbridges on PCB Backside"

The limit values to act on relays **K1...K3** can be set with trimmers **P1...P3**.

Apply the Overload condition on the machine at which the respective relay shall cut off.

If the relay is already off (LED not lit) then turn the trimmer anticlockwise until the relay will get active (LED lit). Then turn the trimmer clockwise until the relay will cut again. Adjustment done.

If the relay is still on (LED lit) then turn the trimmer clockwise until the relay will cut off. Adjustment done.

If switchpoint 3 (controlling relay K3) is an underload switchpoint, (SB 18 and SB21 open, SB 19 and SB20 closed) then apply the underload condition on the machine at which K3 shall cut off.
Do the same procedure as described for the overload switchpoints.

It is advised to seal the trimmer screws after adjustment to have a proof against unauthorized disadjustment.

Adjustment of the Hysteresis

See Appendix B "Elements on PCB Upside"

The Basic Switching Amplifier has hysteresis on all switchpoints in order to suppress unintentional switching of the relays at the set tripping point due to superposed interference voltages or due to dynamic processes. The respective relay in will drop out precisely at the preset limit value, but will not pick up again until after the sensor signal has been reduced to at least the hysteresis value.

Switchpoint 1 for relay K1 has an adjustable hysteresis by means of trimmer potmeter P4. Turning P4 clockwise increase the hysteresis, turning anticlockwise reduces it.
Switchpoints 2 and 3 have a fixed hysteresis.

KST Am Dwarstief 15, 26826 Weener, Germany
+49 (0) 4953 990725, info@kst-systems.de

Setting the Delaytime

See Appendix B "Elements on PCB Upside"

The signal for Switchpoint 1 can be filtered in 4 steps bythe DIP switch in order to provide a delay.

Switch 1	Switch 2	Function
OFF	OFF	No delay
ON	OFF	Delay 150 ms
OFF	ON	Delay 300 ms
ON	ON	Delay 450 ms

From field experience, it is recommended to use a delaytime of 150 ms as a Standard**.**

Sensor Cable Monitoring

See Appendix B "Elements on PCB Upside"

The system is protected against sensor fault and interrupted or shortcircuited sensorcable by a separate watchdog circuit. If the sensors are detected by BSA, the respective LEDs are lit. If not for any of the reasons given above, the LED of the faulty input will not be lit and all relays will cut off for safety reason.

Preventive Maintenance

The KST Basic Switching Amplifier consists of electronic, electrical and mechanical parts. The system may only be serviced and maintained by Service personnel from **KST**, by personnel authorized by the manufacturers, or by personnel who have been specially trained by **KST.**

Since even minor damage can impair the effectiveness of the system or even put it out of action altogether, the operator must check the condition and completeness of the system before starting his daily work.

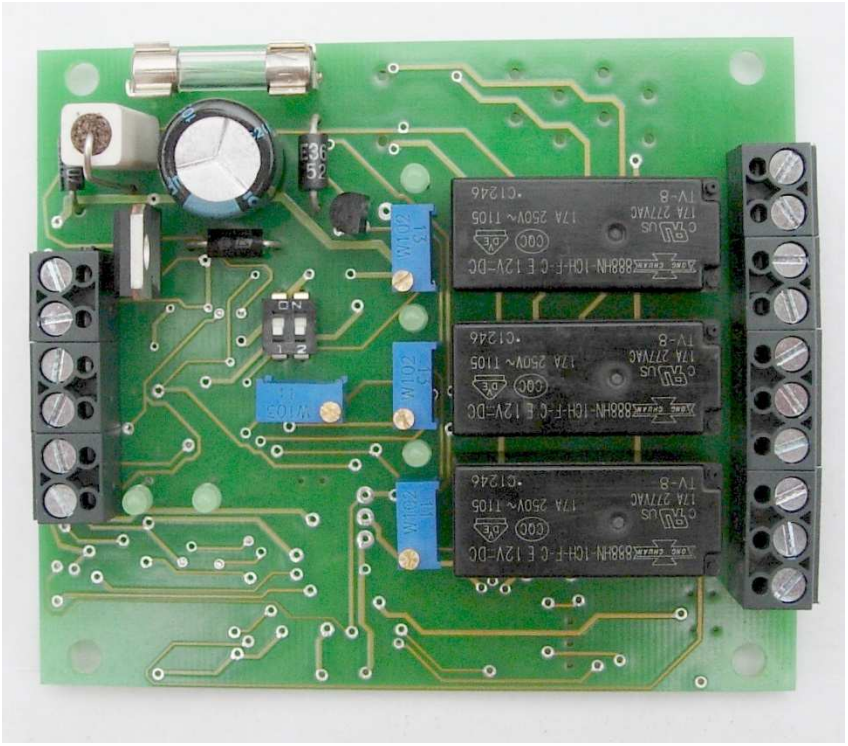
Daily Inspections

To be carried out by the operator:

- Condition of BSA box, cables and Sensors on visual damage
- Overload cut off test

KST Am Dwarstief 15, 26826 Weener, Germany
+49 (0) 4953 990725, info@kst-systems.de

Appendix A: Connection diagram

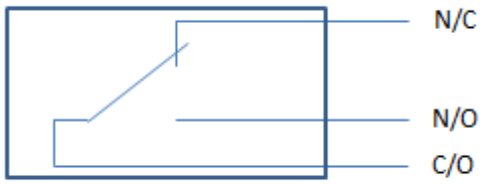


Inputs:

Terminal X1/1	Supply voltage +12/24 V
Terminal X1/2	GND
Terminal X1/3	Analog Input 1
Terminal X1/4	Analog Input 2
Terminal X1/5	GND (for sensors)
Terminal X1/6	4mA source (only for single Sensor mode)

Outputs:

Terminal X2/1	N/O contact relay K1[*1]
Terminal X2/2	C/O contact relay K1
Terminal X2/3	N/C contact relay K1
Terminal X2/4	N/O contact relay K2
Terminal X2/5	C/O contact relay K2
Terminal X2/6	N/C contact relay K2
Terminal X2/7	N/O contact relay K3
Terminal X2/8	C/O contact relay K3
Terminal X2/9	N/C contact relay K3
Terminal X2/10	Analogue output 0,5…8 Volts = average sum of sensor1 + sensor2 voltage[*2]



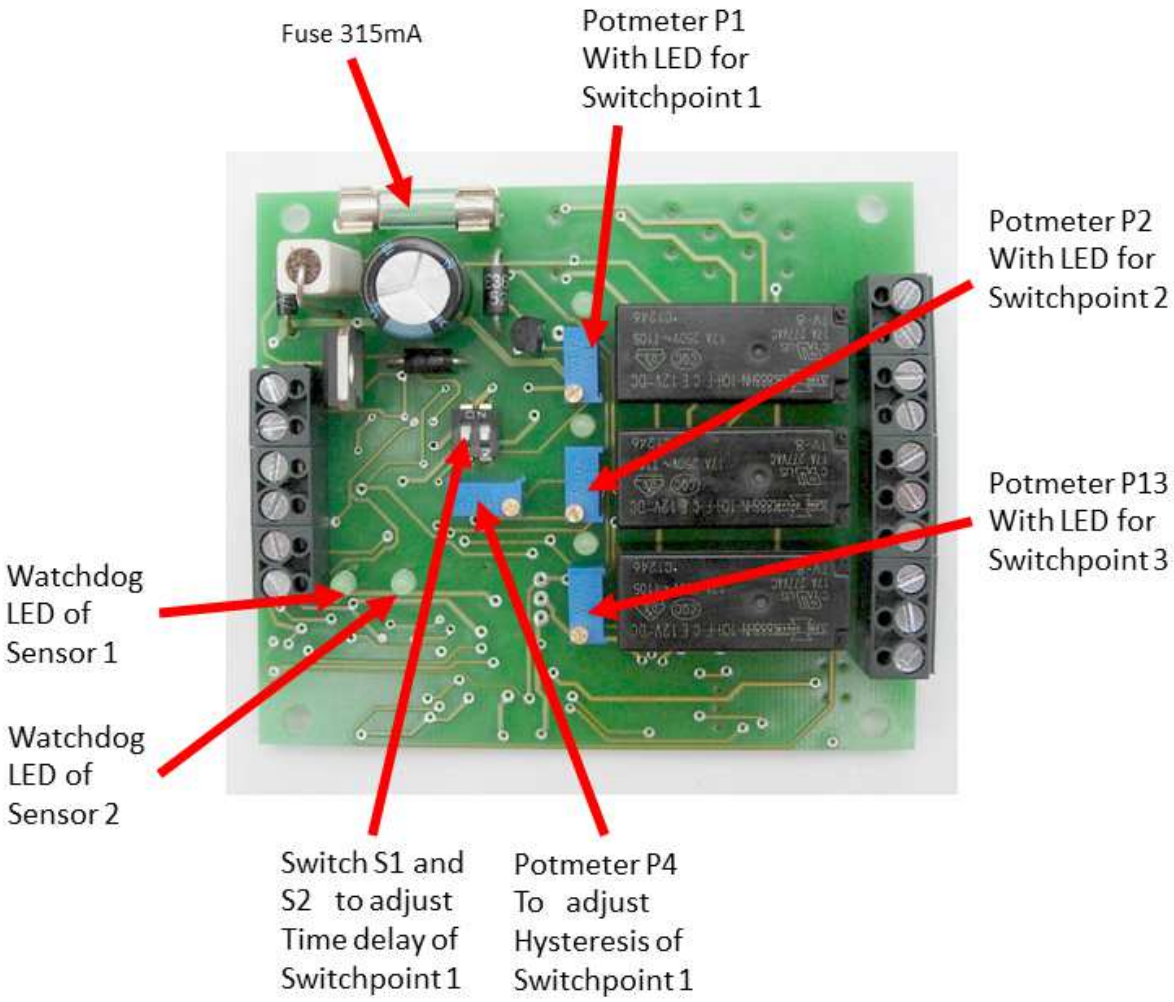
Notes:

1.) Machine STOP functions must be controlled using the C/O and the N/O contacts of the relay

2.) Sensors with 4..20mA signals are converted to Volts with 240 Ohms shuntresistor. Hence, the voltage at terminal X2/10 is = (I_{in1}(mA)*0,24 + I_{in2}(mA) * 0,24)/2; for exs. 16mA + 10 mA -> 3,12V

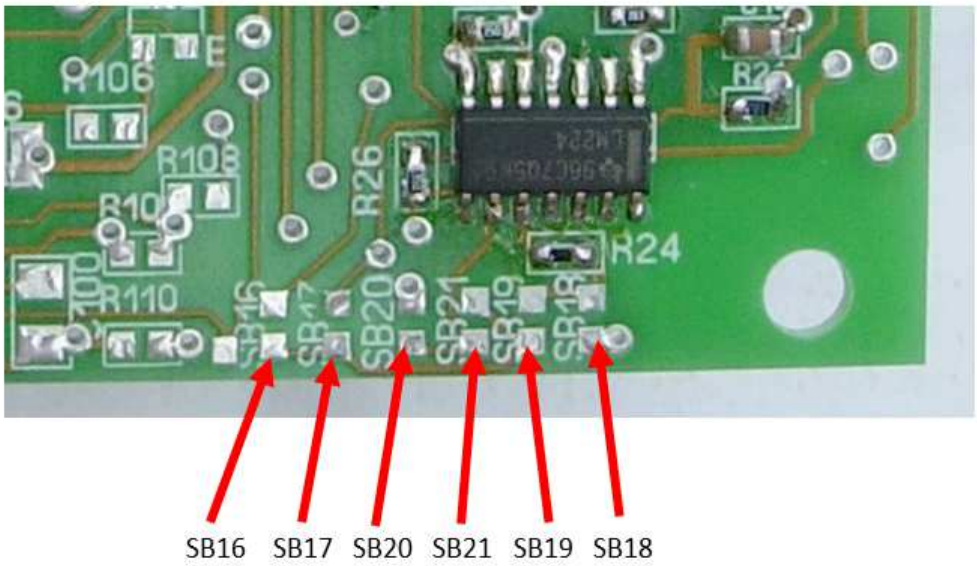
KST Am Dwarstief 15, 26826 Weener, Germany
+49 (0) 4953 990725, info@kst-systems.de

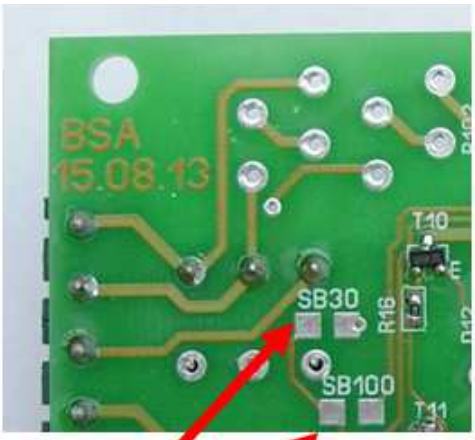
Appendix B: Elements on PCB Upside

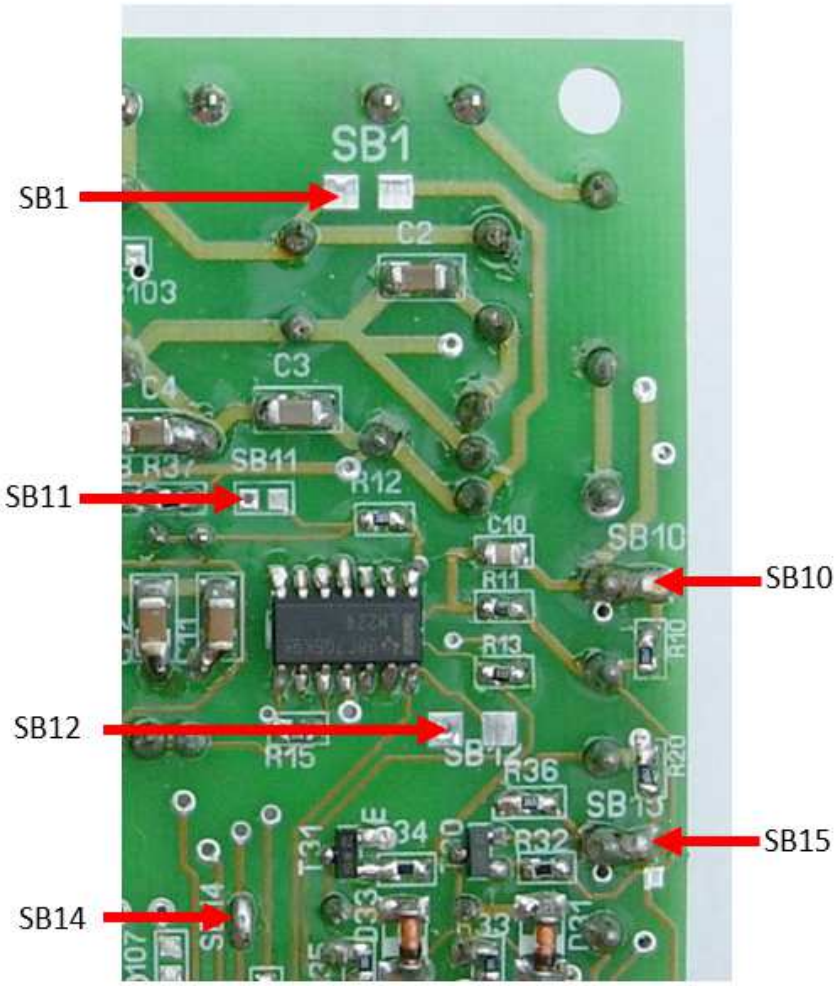


KST Am Dwarstief 15, 26826 Weener, Germany
+49 (0) 4953 990725, info@kst-systems.de

Appendix C: Solderbridges on PCB Backside







KST Am Dwarstief 15, 26826 Weener, Germany
+49 (0) 4953 990725, info@kst-systems.de

NOTES: .

KST Am Dwarstief 15, 26826 Weener, Germany
+49 (0) 4953 990725, info@kst-systems.de