USB Programmable, DIN Form B Connection Head Transmitter

Model ST132-0600 & ST132-0610 Two-Wire Transmitter, TC Input

USER'S MANUAL

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8500-896-J 13L001

TABLE OF CONTENTS

Symbols on equipment:

Means “Refer to User’s Manual (this manual) for additional information”.

For additional information, please visit our web site at www.acromag.com and download our whitepaper 8500-904, Introduction to Two-Wire Transmitters.

IMPORTANT SAFETY CONSIDERATIONS

You must consider the possible negative effects of power, wiring, component, sensor, or software failure in the design of any type of control or monitoring system. This is very important where property loss or human life is involved. It is important that you perform satisfactory overall system design and it is agreed between you and Acromag, that this is your responsibility.

GETTING STARTED

TECHNICAL REFERENCE

DESCRIPTION

The ST132-0600 is an ANSI/ISA Type II transmitter designed to interface with a TC (Thermocouple) sensor, or ±100mV input, and modulate a 4-20mA current signal for a two-wire current loop. This unit is setup and calibrated using the included software and a USB connection to Windows-based PC's. The unit provides automatic cold junction compensation, linearization, and lead break or sensor burnout detection. It also offers a scalable input range.

Key Features

- **Digitally setup and calibrated via USB**
- **Flexible TC or millivolt input support**
- **Provides selectable upscale or downscale Lead-Break Detection**
- **Adjustable Linearization.**
- **High Measurement Accuracy**
- **Non-Polarized Output/Power Connection**
- **Programmable/Scalable Input Range Scaling**
- **Convenient Two-Wire Loop Power**
- **Designed For DIN Form B Sensor Head Mounting**
- **Provides a Linearized Output Response**
- **Easy USB Reconfiguration and Calibration with Included Software**
- **Wide Ambient Operation**
- **Hardened For Harsh Environments**
- **Optional DIN Rail Adapter**
- **CE Approved**
- **Model ST132-0610 is UL Listed (USA & Canada) suitable for use in Class I, Division 2, Groups A, B, C, D Hazardous Locations, or Nonhazardous Locations only.**
- **Model ST132-0610 is ATEX Certified for Explosive Atmospheres.**
  Ⓔx II 3 G Ex nA IIC T4 Gc -40°C ≤ Ta ≤ +80°C
  DEMKO 13 ATEX 1113348X

Application

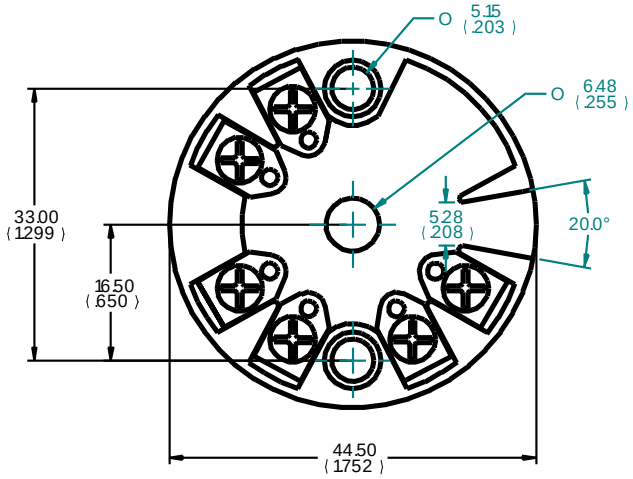
This transmitter is designed for mounting in DIN Form B connection/sensor heads commonly used in thermowell applications for sensing temperature or for use in an enclosure with suitable strength and rigidity.. Optionally, a DIN-rail adapter may be purchased for mounting the unit to T-type, or G-type DIN rail. The transmitter must be installed in an ATEX Certified enclosure with a minimum ingress protection rating of at least IP54. Enclosure must have a door or cover accessible only by the use of a tool (See page 28 for details).

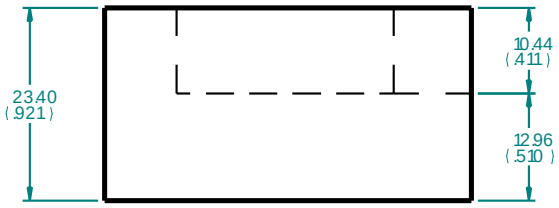
Its non-isolated input is intended to mate with non-grounded, type J, K, T, R, S, E, B, & N thermocouple temperature probes common to these thermowell applications. It provides an output current linearized to the TC sensor temperature. Optionally, it can support simple millivolt inputs and drive an output current linear to the voltage.

The output signal is transmitted via a two-wire, 4-20mA current loop. The two-wire current signal can be transmitted over long distances with high noise immunity. Sensor lead-break detection and the inherent live-zero output offset offers convenient I/O fault detection, should an I/O wire break.

Mechanical Dimensions

Connection Head Mounting





DIN Rail Mounting

35mm T-Type DIN Rail

G-Type DIN Rail

Dimensions in millimeters (inches)

Note that this transmitter conforms to the mechanical limits set forth in the German standard DIN 43 729, for the Form B head style, and can be easily mounted in DIN Form B connection and thermowell protection heads, similar to the figure at upper left.

The M4 mounting screws and relief springs used to attach the transmitter to the connection head are ordered separately via Acromag Mounting Kit ST130-MTG (see Accessories section).

The unit may be optionally mounted to 35mm T-type or G-type DIN rail using the optional DIN mounting kit ST130-DIN as shown at left (see Accessories section).

WARNING – EXPLOSION HAZARD – Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous.

WARNING – EXPLOSION HAZARD – Substitution of any components may impair suitability for Class I, Division 2.

WARNING – EXPLOSION HAZARD – The area must be known to be non-hazardous before servicing/replacing the unit and before installing.

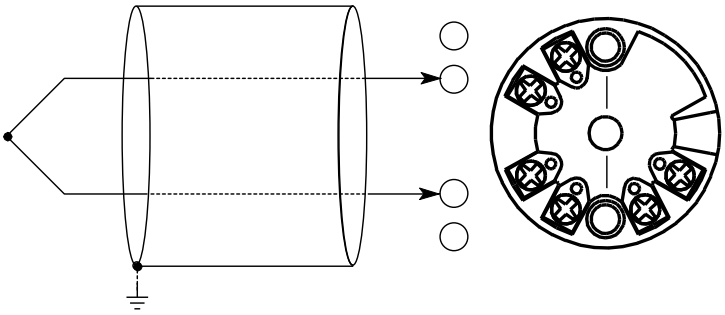
ELECTRICAL CONNECTIONS

Wire terminals can accommodate 14-28 AWG (2.08-0.081mm^2) solid or stranded wire. Input wiring may be shielded or unshielded twisted type. Ideally, output wires should be twisted pair. Strip back wire insulation 3/8-inch on each lead and wrap the bare wire in a clockwise direction around the terminal screw and below the SEMS washer. Tighten the screw to secure the wire at a torque rating range of 0.226 to 0.282 N-m. Terminals include wire loops for test clip attachment, or for redundant soldered wire connection required for heavy shock and vibration applications. Since common mode voltages can exist on signal wiring, adequate wire insulation should be used and proper wiring practices followed. Output wires are normally separated from input wiring for safety, as well as for low noise pickup. Cables and/or conductors in conduit must have a minimum temperature rating of 110°C.

Sensor Input Connections

Sensor wires are passed up through the center of the transmitter and wire directly to transmitter input terminals 2 and 3, as shown in the connection drawings below. Observe proper polarity when making input connections.

- **Use Insulated or Non-Grounded Sensors Only** - Input is non-isolated. Do not ground any input leads.



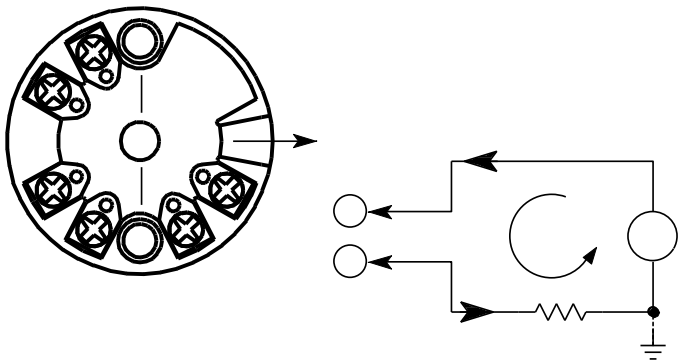
Output/Power Connections

This transmitter has an ANSI/ISA Type 2 output in which the power and output signal share the same two leads, and the transmitter has a floating connection with respect to earth ground. In these applications, output wires normally pass through the output channel on top of the transmitter and are drawn through the egress path of the connection head. Connect a DC power supply and load in series in the two-wire loop as shown in the drawing below.

ELECTRICAL CONNECTIONS

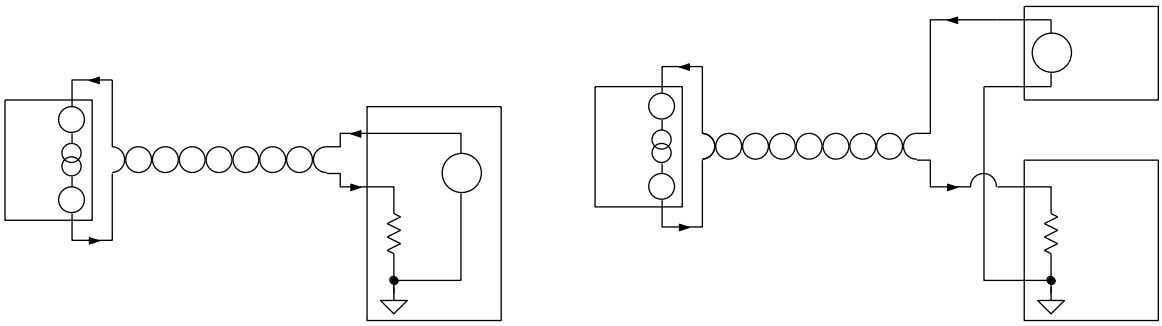
Output/Power Connections

- Output connections are not polarized. The + and – designations are for reference only with current normally input to Output+ and returned via Output-.
- Loop supply voltage should be from 7-32V DC with the minimum level set to supply over-range current to the load, plus 7V across the transmitter, plus any transmission line drop.
- Variations in power supply voltage between the minimum required and 32V maximum, has negligible effect on transmitter accuracy.
- Variations in load resistance has negligible effect on output accuracy as long as the loop supply voltage is set accordingly.
- Note the placement of earth ground in the current loop. This is very important when making a connection to USB and will drive the need for USB isolation (see below).
- Always connect the output/power wires and apply loop power before connecting the unit to USB.



The output of this transmitter has a floating connection relative to ground which makes it flexible in the way it connects to various “Receiver” devices. In most installations, the loop power supply will be local to either the transmitter, or local to the remote receiver. Shielded twisted pair wiring is often used to connect the longest distance between the field transmitter and remote receiver. The receiver device is commonly the input channel of a Programmable Logic Controller (PLC), a Digital Control System (DCS), or a panel meter. Some receivers already provide excitation for the transmitter and these are referred to as “sourcing” inputs. Other receivers that do not provide excitation are referred to as “sinking” inputs, and these will require that a separate power supply connect in the loop.

Here are example transmitter connection diagrams for “sourcing” and “sinking” receiver types:



WARNING: For compliance to applicable safety and performance standards, the use of twisted pair output wiring is recommended. Failure to adhere to sound wiring and grounding practices as instructed may compromise safety, performance, and possibly damage the unit.

ELECTRICAL CONNECTIONS

Output/Power Connections

TIP - Ripple & Noise: Power supply ripple at 60Hz/120Hz is normally reduced at the load by the transmitter, but additional filtering at the load can reduce the ripple further. For large 60Hz supply ripple, connect an external 1uF or larger capacitor directly across the load to reduce excessive ripple. For sensitive applications with high-speed acquisition at the load, high frequency noise may be reduced by placing a 0.1uF capacitor directly across
the load.

TIP - Inductive Loads: If the two-wire current loop includes a highly inductive load (such as an I/P current-to-pressure transducer), this may reduce output stability. In this case, place a 0.1uF capacitor directly across the inductive load and this will typically cure the problem.

Earth Ground Connections

The unit housing is plastic and does not require an earth ground connection. If the transmitter is mounted in a metal housing, a ground wire connection is typically required and you should connect the metal enclosure’s ground terminal (green screw) to earth ground using suitable wire per applicable codes. See the Electrical Connections Drawing for Output/Power and note the traditional position of earth ground for the two-wire output current loop. The Type II transmitter output terminals have a floating connection relative to earth ground. Earth ground is normally applied at the output loop power minus terminal and in common with the loop load or loop receiver minus.

- Do not earth ground any input lead and use only insulated/non-grounded TC sensors. This transmitter does not isolate its input signal.
- Respect the traditional position of earth ground in a two-wire current loop and avoid inadvertent connections to earth ground at other points, which would drive ground loops and negatively affect operation. This includes the USB connection to the transmitter, which should be made via a USB isolator, as most Personal Computers earth ground their USB ports and this makes contact with both the signal and shield grounds.

USB Connections

This transmitter is setup, configured, and calibrated via configuration software that runs on a Windows-based PC that is connected to the unit via USB. Refer to the drawing below to connect your PC or laptop to the transmitter for the purpose of reconfiguration and calibration using this software.

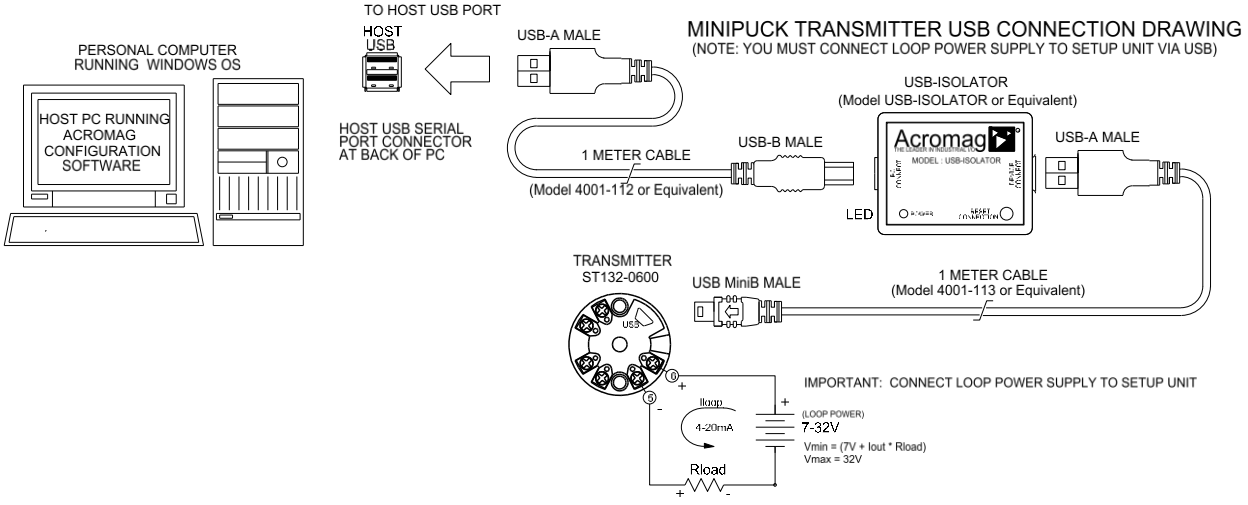
WARNING – USB Connector is not for operational or maintenance use in hazardous locations. The intent of mating USB with this transmitter is so that it can be conveniently setup and calibrated in a safe area, then installed in its connection head, which may be in a hazardous area. Do not attempt to connect a PC or laptop to this unit while installed in a hazardous environment, as USB energy levels could ignite explosive gases or particles in the air.

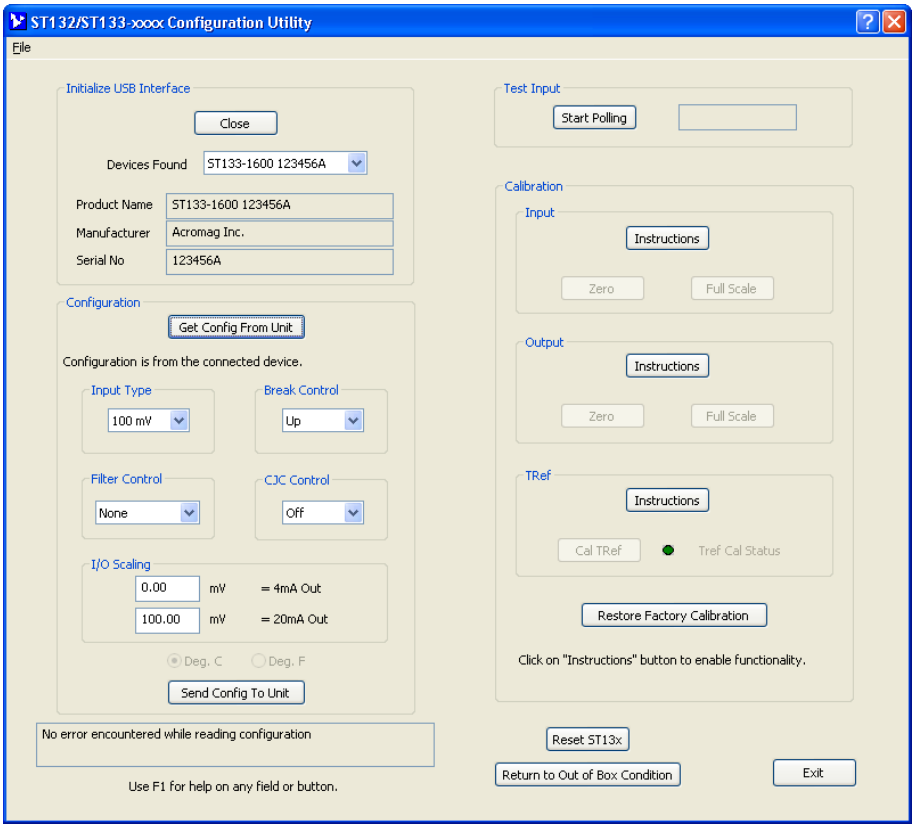
ELECTRICAL CONNECTIONS

USB Connections

- **USB Signal Isolation Required (See Below) -** You may use Acromag model USB-ISOLATOR to isolate your USB port, or you can optionally use another USB signal isolator that supports USB Full Speed operation (12Mbps).
- **Configuration Requires USB and Loop Power** - This transmitter draws power from both the current loop and from USB during setup.
- **Connect Loop Power Before USB** - Always connect the transmitter to its loop power supply before connecting USB, or erratic operation may result.

IMPORTANT: All USB logic signals to the transmitter are referenced to the potential of its internal signal ground. This internal ground is held in common with the USB ground and shield ground. The potential of the transmitter's current output pin (output minus) relative to earth ground will vary according to the load current and load resistance (net IR drop). Without isolation, this IR voltage drop would drive a potential difference between the normally grounded current loop and the grounded USB connection at the PC, causing a ground loop that would inhibit setup and calibration, and may even damage the transmitter. This is why an isolated USB connection is recommended. You could alternately avoid the use of an isolator if a battery powered laptop was used to connect to the transmitter, and the laptop has no other earth ground connection.





CONFIGURATION SOFTWARE

Introduction

This transmitter can only be configured and calibrated via its Configuration Software and a USB connection to your PC or laptop. The configuration software can be downloaded free of charge from our web site at www.acromag.com. This software is also included on a CDROM bundled with the Configuration Kit ST13C-SIP (see Accessories section). For this model, look for program ST132-ST133 Config.exe. The software is compatible with XP or later versions of the Windows operating system.

The configuration software screen for this model is shown at left. The configuration screen is divided into five sections as follows: USB Interface, Configuration, Test, Calibration, and the Message Bar and controls at the bottom of the screen. Additionally, there is a Reset button, a button to restore the unit to the factory default state, and a button to exit the program. A short description of each of these groups follows. For a detailed explanation, see Configuration Step-by-Step in the Technical Reference section of this manual.

HELP – You can press F1 for Help on a selected or highlighted field or control. You can also click the [?] button in the upper-right hand corner of the screen and then click to point to a field or control to get a Help message pertaining to the item you pointed to.

USB Interface

- Scans for connected transmitters and allows you to selectively open communications with them.
- Devices Found: Connected transmitters are listed in this pull-down select menu. Click to highlight a transmitter and then click the “Open” button to open communications with it.
- Open/Close Button: Click this button to open or close communication with the selected transmitter listed in the Devices Found field.
- Displays the model number (Product Name), Manufacturer, and Serial Number of the connected/selected transmitter.

The software automatically scans for connected transmitters when it is booted. You can select a connected transmitter and open communications with it from the Device Found pull-down menu. The connected/selected transmitter’s ID info (Product Name/serial, Manufacturer, & Serial Number) is also displayed. Device connection status messages are also indicated in the System Message Window at the bottom of the screen.

Configuration Area

- **Input Type:** Set the Input Type, J, K, T, E, R, S, B, N, or ±100mV.
- **Break Control:** Set the break detection direction (Up or Down).
- **Filter Control:** Set the level of filtering to be applied to the input signal.
- **CJC Control:** Select if the CJC is used (On or Off).
- **I/O Scaling:** Select the input range endpoints to scale to the 4 to 20mA output range endpoints. You can optionally set this up for a reverse-acting output by swapping the signals.

CONFIGURATION SOFTWARE

Introduction

You can click on "File" in the upper left hand corner to open a previously saved file, save your own file, or print out your configuration.

You can refer to the Configuration Step-by-Step section of the Technical Reference portion of this manual for a more detailed description of every control described here.

Use the controls of the Configuration section to select an input type, the break detent, filter level, CJC on/off, and input range scaling.

Test Input Area

- **Polling Toggle & Input Display Field:** This button will toggle polling of the input on/off and display the input level in the adjacent field.

Calibration Area (See Configuration Step-by-Step for Procedure)

- **Input:** This section calibrates the selected input range.
- **Output:** This section calibrates the 4 to 20mA output.
- **TRef:** This section calibrates the cold-junction temperature reference for cold junction compensation of the T/C.
- **Restore Factory Calibration Button:** This button will restore only the original factory calibration to the unit. Note that this will not reset any of the configuration settings.

This section is used to calibrate the input, output, and CJC temperature sensor of the unit. Instructions on how to calibrate the unit is detailed in the Configuration Step-by-Step section of the Technical Reference portion of this manual.

Message Bar

- Displays the Fault Status of your transmitter input signal.
- Displays prompt instructions during calibration.

The system message bar at the bottom of the screen will display & repeat prompt instructions as you step through calibration. It also displays diagnostic messages (see Configuration Step-by-Step section for specific messages).

Other Options:

- **Reset ST13x:** This button will reset the ST132 unit.
- **Restore to Out of Box Condition:** This button will restore **ALL** configuration settings and calibration to their original factory settings.

You can click the "Restore Factory Settings" button if you ever miscalibrate or misconfigure a transmitter in such a way that its operation appears erratic.

POSSIBLE CAUSE	POSSIBLE FIX
Software Fails to Scan Transmitter…	
Bad USB Connection	Recheck USB Cable Connection
USB has not enumerated the device.	Use the reset button on the USB isolator to trigger renumeration of the transmitter, or simply unplug/plug the USB cable to the transmitter.
Communication or power was interrupted while USB was connected and the configuration software was running.	Close the current connection with the software, re-scan the transmitter, select and re-open the transmitter for communication (or simply exit the Configuration software and reboot it).
Output Erratic or Not operational…	
Missing USB isolation	If your two-wire output current loop is grounded, then connecting USB to the transmitter will drive a ground loop between your current loop and earth ground at the PC. Always use USB signal isolation, or alternatively, you can connect directly to a laptop, which does not earth ground its USB connection.
Output goes Overscale or Underscale…	
This indicates that the input signal is out of range, or an input lead has broken.	Check your sensor connections to restore operation. If connections are OK, then your sensor value may be out of range, or the unit has been miscalibrated.
Cannot Communicate with Transmitter via USB…	
Loop power ON to the unit?	Unit requires loop power connection, even when connected to USB. The loop power supply should also be present before connecting to USB power.
Cannot Communicate with Transmitter via USB…	
A missing USB Isolator could cause a ground loop when connecting to USB from a Personal Computer.	A ground loop is created between a normally grounded two-wire current loop and earth ground of the PC USB port. Only connect to USB via a USB isolator, like the Acromag USB-ISOLATOR. Otherwise, use a battery powered laptop to configure the transmitter.

TROUBLE-SHOOTING

Diagnostics Table

*Before attempting repair or replacement, be sure that all installation and configuration procedures have been followed and that the unit is wired properly. Verify that power is applied to the loop and that your loop power supply voltage is sufficient to supply over-scale current into the load (MIN 0.020*Road), plus 7V at the module terminals, plus any line drop.*

If your problem still exists after checking your wiring and reviewing this information, or if other evidence points to another problem with the unit, an effective and convenient fault diagnosis method is to exchange the questionable unit with a known good unit.

Acromag's Application Engineers can provide further technical assistance if required. Repair services are also available from Acromag.

TROUBLE-SHOOTING

Diagnostics Table

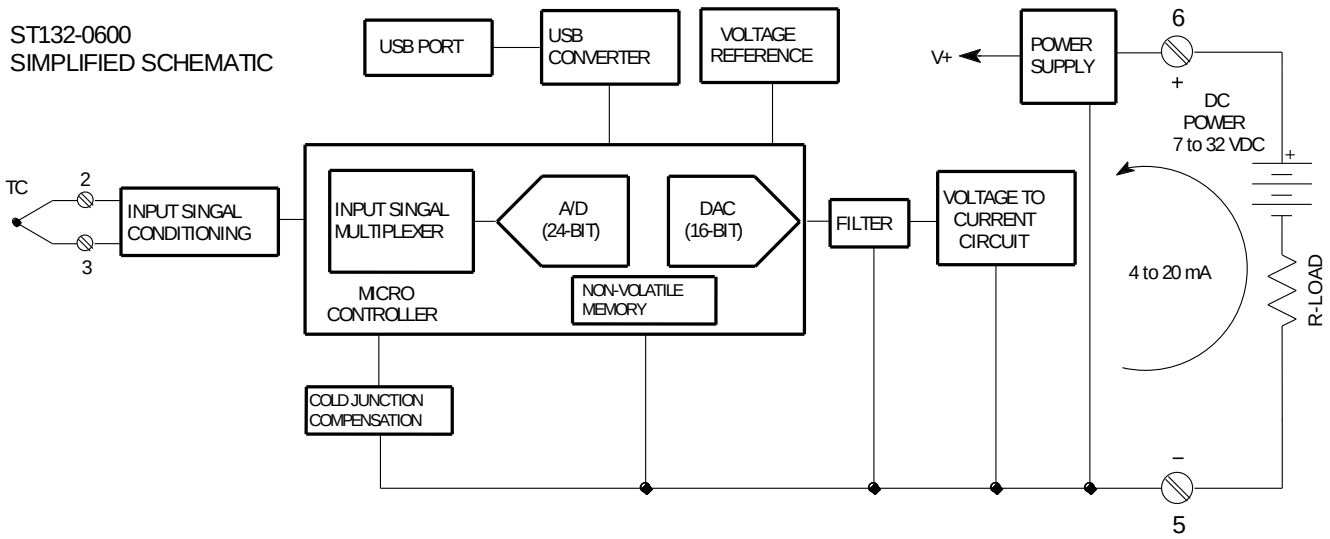
POSSIBLE CAUSE	POSSIBLE FIX
Output appears to be noisy…	
This usually results from a noisy input signal.	Use the "Filter-Control" to select a medium or high filter to reduce the noise
Unit fails to operate or has an erratic output signal…	
Is input grounded?	This non-isolated model is intended for use with ungrounded T/C sensors and a grounded probe could inadvertently short the input bias voltage causing erroneous operation, in particular if the output loop is already grounded.
Unit drives a low current output, but fails to drive current at/near 20mA…	
Loop supply voltage is too low to support full-scale or over-range current into the loop load.	Check power supply voltage level. Make sure it is at least 7V plus 0.020*Rload. If transmission distance is long, than it must have additional voltage to support the IR drop in the wire. Ideally, the voltage should have ample overhead to drive the load at the maximum output current of 25mA
Cannot Calibrate Input Channel…	
Is input wired properly?	Check input wires at terminals 2 & 3.
Cannot Calibrate Input Channel…	
You may have blown the input PGA via a ground loop, or incorrect wiring.	If you cannot get the output signal to vary for a continuously variable input signal, your input signal is within range, and you have properly wired the input including connections to input terminal 4, then your input amplifier may have been damaged and the unit will need to be replaced.

Service & Repair Assistance

This module contains solid-state components and requires no maintenance, except for periodic cleaning and transmitter configuration parameter (zero and full-scale) verification. The potted Surface Mounted Technology (SMT) board contained within is difficult to repair. It is highly recommended that a non-functioning transmitter be returned to Acromag for repair or replacement. Acromag has automated test equipment that thoroughly checks and calibrates the performance of each transmitter, and restores firmware. Please refer to Acromag's Service Policy and Warranty Bulletins, or contact Acromag for complete details on how to obtain repair or replacement.

TECHNICAL REFERENCE

Block Diagram



These transmitters will interface DC millivoltage or thermocouple input signals and provide a convenient USB interface for configuration, monitoring, and control of the input module. A multiplexer is used to connect the input to
a 24-bit A/D converter built into the microcontroller. A separate temperature sensor is used to accomplish thermocouple cold junction compensation and are also is multiplexed to the A/D. The 24-bit A/D converter then applies appropriate gain to the signals, digitally filters the signals, and performs analog-to-digital conversion. The A/D converter also switches the lead pullups/pulldowns to facilitate upscale or downscale thermocouple break detection. The microcontroller completes the transfer function according to the input type and its embedded program. Configuration and calibration parameters are stored in non-volatile memory integrated within the microcontroller. The I/O screw terminals include transient suppression. A wide input range regulator provides power to the I/O circuits and the microcontroller. The 4 to 20mA output is generated from the microcontroller's built in 16-bit DAC using a voltage to current circuit.

CONFIGURATION STEP-BY-STEP

Calibration Connections

IMPORTANT: Do not connect the transmitter to your PC via USB without also booting the configuration software. Connection to USB is intended as a temporary connection for the purpose of setup and reconfiguration only. If you connect to USB but do not boot the configuration, the output DAC will hold its last programmed value as the unit's microcontroller awaits initialization via the host running configuration software.

This section of the manual will walk you through the reconfiguration process step-by-step. But before you attempt to reconfigure or recalibrate this transmitter, please make the following electrical connections:

Calibration Connections:

1. Connect a precision voltage source or thermocouple calibrator to the input as required, and observe proper polarity.

   An accurate input source adjustable over the range desired for zero and full-scale is required. A thermocouple calibrator may also be used. The input source must be accurate beyond the unit specifications (better than ±0.1%). A good rule of thumb is that your source accuracy should be four times better than the rated accuracy you are trying to achieve with the transmitter. For voltage inputs, use a voltage source with an output impedance of 100Ω or less.

   In the absence of a thermocouple calibrator, a convenient method of configuring the TC input would be to use a precision mV source with the module's CJC set to OFF. Using this method allows the mV source to be wired directly to the input T/C terminals using copper wires. The module's cold junction compensation is turned off and the mV values applied to the input are the equivalent thermoelectric voltages that correspond to the minimum and maximum temperatures of your desired input range, and specific to each T/C type. Refer to the table of the following page for a list of thermocouple voltages at specific temperatures. After setting zero and full-scale in this manner, the CJC switch should be returned back to the ON position to enable cold junction compensation.

2. Wire an output current loop to the transmitter as shown in the Electrical Connections section. You will need to measure the output current accurately in order to calibrate the unit. You could connect a current meter in series in this loop to read the loop current directly. Alternatively, you could simply connect a voltmeter across a series connected precision load resistor in the loop, then accurately read the output current as a function of the voltage IR drop produced in this resistor (recommended). In any case, be sure to power the loop with a voltage that minimally must be greater than the 12V required by the transmitter, plus the IR drop of the wiring and terminals, plus the IR drop in the load. To compute the IR drop, be sure to use a current level that considers the over-scale current (~24mA). The output load resistance and meter must be accurate beyond the unit specifications (better than ±0.1%). A good rule of thumb is that your load and meter accuracy should be four times better than the rated accuracy that you are trying to achieve with the transmitter.

   Loop Power Supply: Make sure that your power supply voltage level is at least 12V plus 0.020*load_resistance. Ideally, it should be great enough to drive the over-range current of ~24mA into your load (i.e. greater than or equal to 12V+ 0.024*Rload, assuming the line drop is negligible and the maximum possible over-range current.

   Apply power to the transmitter output loop and always power the loop before connecting to USB. You will not be able to calibrate the unit without loop power applied.

CONFIGURATION STEP-BY-STEP

Calibration Connections

3. Connect the transmitter to the PC using the USB isolator and cables provided in Configuration Kit ST13C-SIP (refer to Electrical Connections section). You may omit the isolator if you are using a battery powered laptop to connect to the unit, or if your input source is not already grounded.

   Now that you have wired the unit, applied power, and connected the unit to USB, you can execute the Configuration Software program for your model (ST132-ST133Config.exe) to begin reconfiguration. This software is only compatible with XP or later versions of the Windows operating system.

Thermocouple milliVoltage Versus Temperature
(From the National Institute of Standards and Technology (NIST) Thermocouple Tables)

TEMP	Thermoelectric Voltage In milliVolts (With Reference Junction at 0°C)							
°C	J	K	T	E	R	S	B	N
- 260		---	**-6.232**	---	---		---	---
- 250	---	---	-6.180	---	---	---	---	---
- 230	---	---	-6.007	---	---	---	---	**-4.226**
- 210	**-8.095**	---	-5.753	---	---	---	---	-4.083
- 200	-7.890	**-5.891**	-5.603	**-8.825**	---	---	---	-3.990
- 150	-6.500	-4.913	-4.648	-7.279	---	---	---	-3.336
- 100	-4.633	-3.554	-3.379	-5.237	---	---	---	-2.407
- 50	-2.431	-1.889	-1.819	-2.787	**-0.226**	**-0.236**	---	-1.269
0	0.000	0.000	0.000	0.000	0.000	0.000	---	0.000
+ 50	2.585	2.023	2.036	3.048	0.296	0.299	---	1.340
+ 100	5.269	4.096	4.279	6.319	0.647	0.646	---	2.774
+ 150	8.010	6.138	6.704	9.789	1.041	1.029	---	4.302
+ 200	10.779	8.138	9.288	13.421	1.469	1.441	---	5.913
+ 250	13.555	10.153	12.013	17.181	1.923	1.874	---	7.597
+ 260	14.110	10.561	12.574	17.945	2.017	1.962	**0.317**	7.941
+ 300	16.327	12.209	14.862	21.036	2.401	2.323	0.431	9.341
+ 350	19.090	14.293	17.819	24.964	2.896	2.786	0.596	11.136
+ 390	21.297	15.975	20.255	28.146	3.304	3.164	0.746	12.603
+ 400	21.848	16.397	**20.872**	28.946	3.408	3.259	0.787	12.974
+ 450	24.610	18.516	---	32.965	3.933	3.742	1.002	14.848
+ 500	27.393	20.644	---	37.005	4.471	4.233	1.242	16.748
+ 550	30.216	22.776	---	41.053	5.021	4.732	1.505	18.672
+ 600	33.102	24.905	---	45.093	5.583	5.239	1.792	20.613
+ 650	36.071	27.025	---	49.116	6.157	5.753	2.101	22.556
+ 700	39.132	29.129	---	53.112	6.743	6.275	2.431	24.527
+ 760	**42.919**	31.628	---	57.870	7.461	6.913	2.854	26.883
+ 800	---	33.275	---	61.017	7.950	7.345	3.154	28.455
+ 900	---	37.326	---	68.787	9.205	8.449	3.957	32.371
+ 950	---	39.314	---	72.603	9.850	9.014	4.387	34.319
+1000	---	41.276	---	**76.373**	10.506	9.587	4.834	36.256
+1200	---	48.828	---	---	13.228	11.951	6.786	43.846
+1300	---	52.410	---	---	14.629	13.159	7.848	**47.513**
+1372	---	**54.886**	---	---	15.645	14.033	8.642	---
+1400	---	---	---	---	16.040	14.373	8.956	---
+1600	---	---	---	---	18.849	16.777	11.263	---
+1700	---	---	---	---	20.222	17.947	12.433	---
+1750	---	---	---	---	20.877	18.503	13.014	---
+1768	---	---	---	---	**21.101**	**18.693**	13.223	---
+1800	---	---	---	---	---	---	13.591	---
+1820	---	---	---	---	---	---	**13.820**	---

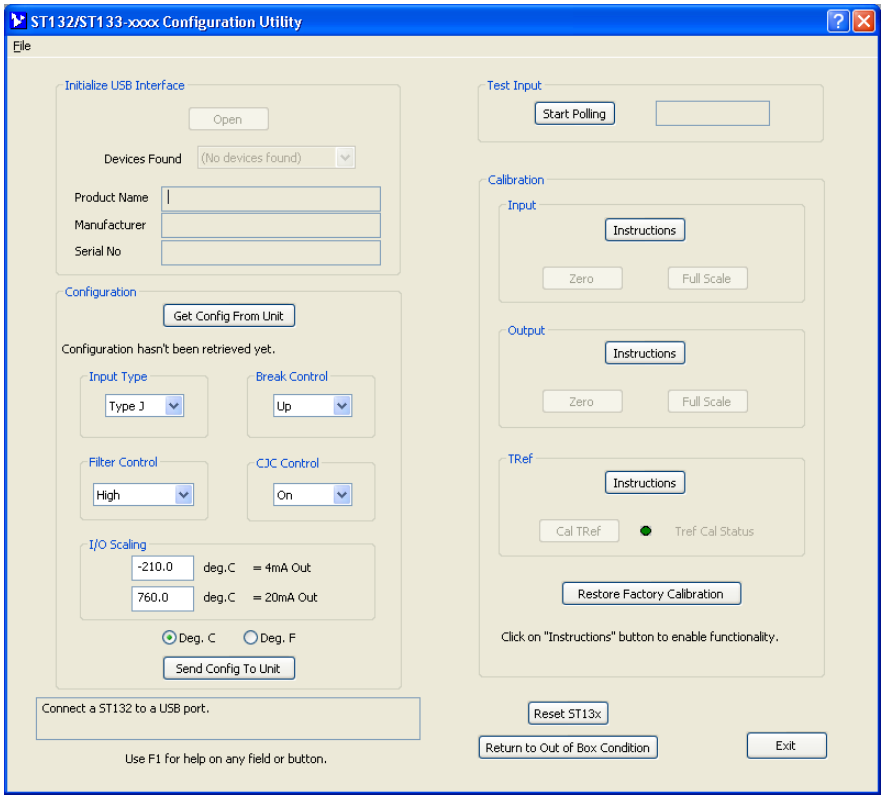
Note (Table): Shaded cells refer to the calibration range end points used to calibrate the T/C type for this model. Bold column entries refer to the nominal T/C input range end points of this model.

CONFIGURATION STEP-BY-STEP

Reconfiguration

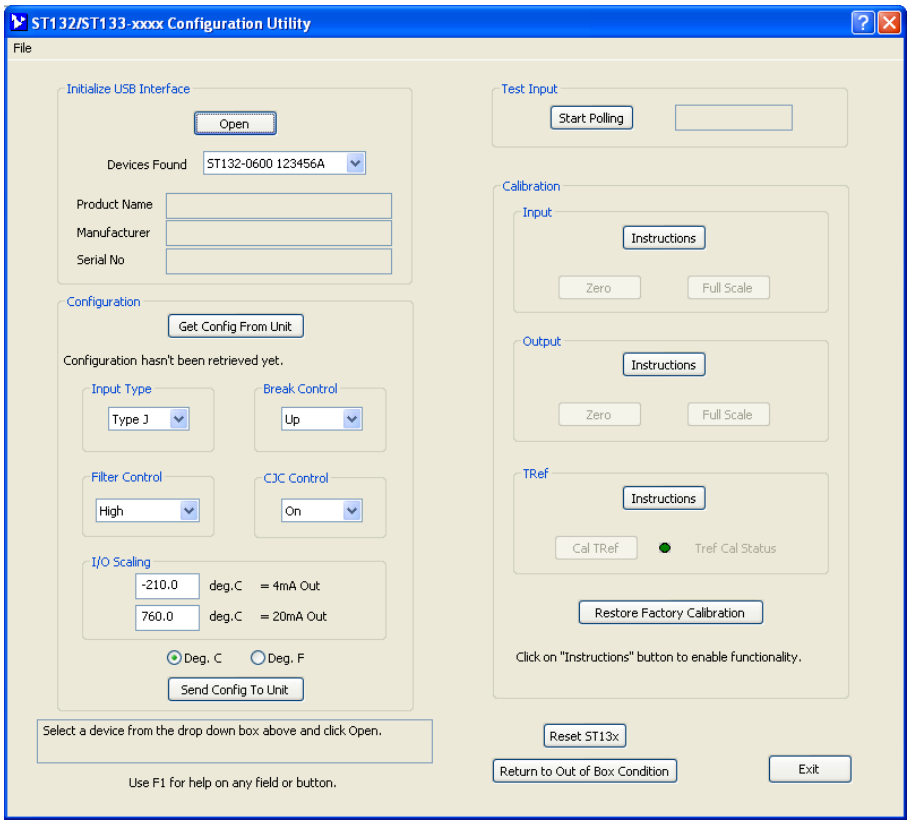
After executing the Acromag Configuration software for this model, a screen similar to the one at right will appear, if you have not already connected to your transmitter via USB (note some fields are faded out under these conditions).

Note that without a device already connected via USB, the System Status window at the bottom of the screen prompts you to “Connect a ST132 to a USB port”.



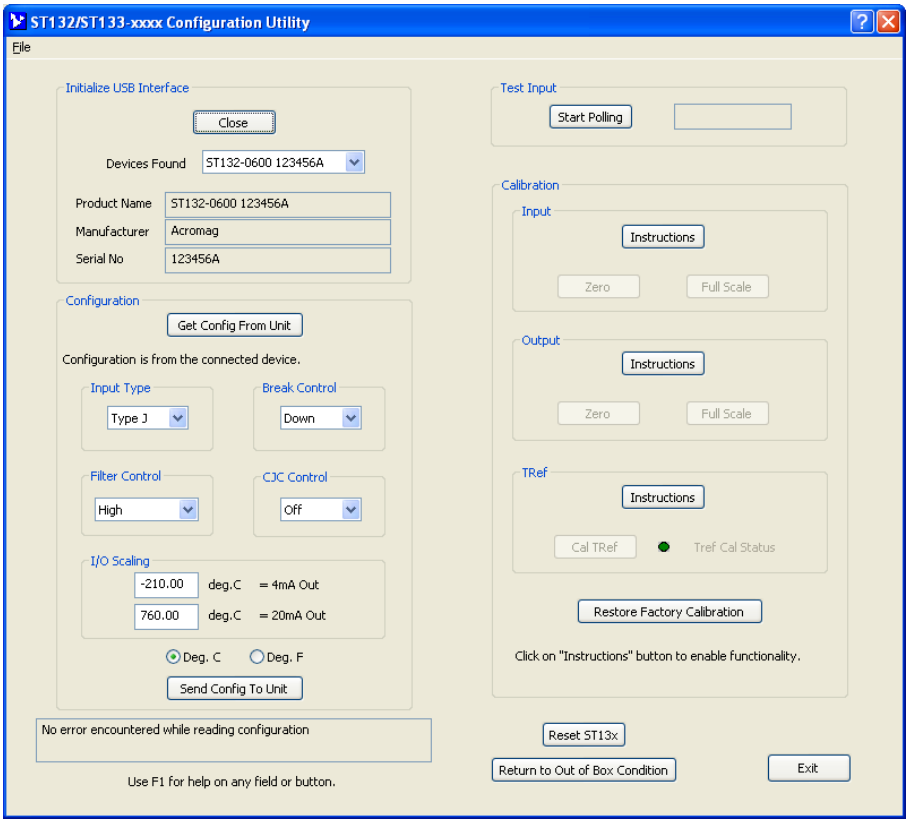
After you connect a transmitter to the USB port, the software will automatically detect it and the screen will change similar to the one at right.

Note that with a device already connected via USB, the System Status window prompts you to “Select a device from the drop down box above and click Open”.

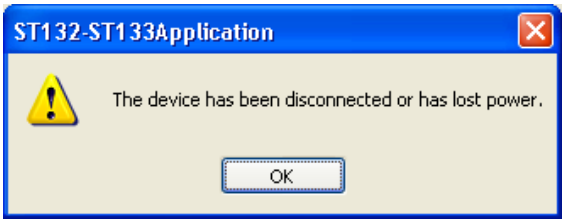


HELP – You can press F1 for Help on a selected or highlighted field or control. You can also click the [?] button in the upper-right hand corner of the screen and click to point to a field or control to get a Help message pertaining to the item you pointed to.

At this point, you can select a device from the “Devices Found” field pull-down menu by clicking on it, then clicking the “Open” button to connect to the device for the purpose of reconfiguration and/or test (use the serial number to discern a particular transmitter). The screen should then appear similar to the one shown below. Note that “No error encountered while reading configuration” is displayed in the System Message Window at the lower left corner of the screen. Additionally, the device Product Name field displays the Model, the Manufacturer field displays “Acromag, Inc.”, and the Serial field displays this model’s serial number. Additionally, most of the other fields and controls are not faded out and await your input.



If more than one transmitter was connected via USB through a hub, you can discern which transmitter to open by referring to the product’s unique serial number appended to the Product Name. If your intent was to open a different transmitter on the hub, then you simply “Close” the current connection and use the Devices Found scroll bar to select another transmitter (discern by serial number), then click “Open” to open it for communication. If you break the USB connection to a transmitter, the software will display the following:



CONFIGURATION & CALIBRATION

Reconfiguration

HELP – You can press F1 for Help on a selected or highlighted field or control. You can also click the [?] button in the upper-right hand corner of the screen and click to point to a field or control to get a Help message pertaining to the item you pointed to.

CONFIGURATION STEP-BY-STEP

Reconfiguration

After clicking “OK”, the software closes the connection and the screen returns back to its initial state, prior to connecting a module to USB. When you reconnect the USB cable, you will have to click “Open” to reopen communication with the transmitter. If you have more than one transmitter connected via a hub, then you will have to use the Device Name scroll bar to first select a transmitter (discern unit by serial number), and then click “Open” to open communication with it.

Note that if you intend to Test or Calibrate any elements of this transmitter, you should already have loop power connected to the transmitter before you execute this software.

At this point, the connected transmitter is ready for reconfiguration and the appropriate configuration fields become active and await your input.

If you want to see how the connected unit is already configured before changing its configuration, click the “Get Config From Unit” button of the Configuration controls section to retrieve its current configuration information. Note the message bar at the bottom of the screen and it should display a message like “No error encountered while reading configuration”

Select the Input Type (T/C Type or ±100mVDC)…

In the Configuration section of this screen, select an input type: T/C Type J, K, T, R, S, E, B, N, or 100mV.

- If you select any T/C type, your output will be linear with respect to sensor temperature, not sensor millivolts.
- If you select “100mV”, your output current will be linear with respect to input voltage, not temperature, and no special linearization will be performed. Note that “100mV” represents ±100mV range capability.

Select Upscale or Downscale Lead Break Detection…

Upon sensor burnout or a broken sensor lead, you can select **“Downscale**” to send the output current to its down-scale limit (~3.5mA), or **“Upscale”** to send the output current to the over-scale limit (~24mA). You can usually discern, a lead break or open sensor from an over-range or under-range input signal by noting its current level. Note that outputs can be reverse acting, and upscale for a reverse acting output will remain ~24mA. Likewise, downscale for a reverse acting output still corresponds to a current level ~3.5mA.

Select a Filter Control Level (None, Low, Medium, or High)…

Note that in addition to the analog filters of this unit, it also has the capability of applying digital filtering. Increased filtering is useful to help minimize the negative effects of noisy input signals, but will increase the response time of the unit accordingly. You can select the amount of filtering as None, Low, Medium, or High. Note the approximate response times indicated next to each filter level.

CONFIGURATION STEP-BY-STEP

Reconfiguration

Turn Cold Junction Compensation (CJC) On, or Off…

This model embeds a very accurate temperature sensor in the space between the input + and – terminals in order to cold-junction compensate the thermocouple signal. To explain, the voltage measured from the T/C reflects the difference in temperature between each end. Thus, in order to discern the actual temperature being sensed, it is necessary to know the temperature at the other end, and this is usually referred to as the Cold Junction.

Further, the connection between the thermocouple and the copper terminals of the cold junction introduces additional thermocouples into the circuit. However, because these errant thermocouples that occur at the junctions of the ± terminals are close together and at identical temperatures, their effect on the principal measurement cancels out of the derivation. But to keep error to a minimum, you should still avoid any environmental or installation effects that could drive a difference in temperature between the ± input terminals. For example, touching one terminal and not the other.

You normally turn CJC On via this control for making T/C measurements, but you can elect to turn it off temporarily, if you wish to calibrate the T/C input using a voltage source that connects to the module via copper wires (as opposed to the wire materials of the various thermocouple types).

Note: *CJC temperature values are only resolved to 0.1°C using the internal lookup tables for the T/C type. As such, units configured for small input spans may appear less accurate with CJC ON, as ±0.1°C becomes a greater percentage of a smaller span. Keep this in mind when resolving measurements with short spans and high gains.*

Set the I/O Scaling (You can set this up to be Reverse Acting too)…

This control is used to map your input range, or a portion of your input range, to the nominal 4mA (0%) and 20mA (100%) output range endpoints. Refer to the specifications to determine the full input range capability of the various input types. Then select valid input range endpoints to map to 4mA and to 20mA. Note that it is possible to exchange the order of these value assignments in order to define a reverse-acting output signal.

You need to select the input temperature or millivoltage that is to correspond to 4mA of output signal and type this value into the corresponding field for 4mA output. You also need to do this for the 20mA output endpoint.

Note: Note that the effective input resolution does not rescale itself for input spans smaller than the nominal input range. That is, input resolution diminishes proportionally as you reduce the input span with smaller input ranges than nominal (see Specifications section for nominal ranges and resolution).

Note that some under-range and over-range is built-into the unit, as the output can swing as low as 3.5mA, and as high as 24mA. Actual endpoint limits will vary slightly between units.

CONFIGURATION STEP-BY-STEP

Reconfiguration

If the input zero and full-scale points are chosen too close together (span too small), resolution is diminished and the performance will be degraded. A minimum effective span of 10mV is recommended. Also, you should pick your values carefully, as you will have to precisely drive the corresponding input signal values for zero and full-scale in order to calibrate your input range later.

(Optional) Test Your Input…

The Test Input area of your screen is useful to view your continuously variable input measurement in the field adjacent to the Start/Stop Polling button. Simply click the "Start Polling" toggle button, and the input will be repeatedly polled and displayed in the adjacent field. Click this button again to turn polling off.

Note that if CJC is ON, and your input signal is at 0°C (0.000mV), the temperature value displayed will be equivalent to the ambient temperature at the input terminals (i.e. your cold junction). You can get a feel for how stable CJC temperatures are by doing this.

You should turn polling off while trying to calibrate the unit, or change its configuration.

Zero & Full-Scale Calibration

Calibration of Input, Output, and Tref…

This section is used to calibrate the input, output, and cold junction temperature reference of the unit. You can begin calibration of any of these three stages by clicking the corresponding "Instructions" button and following the on-screen prompts. Note that the button text will change according to the step.

Each calibration is an interactive process in which the software prompts you to apply input signals and then measure the corresponding output current. First, it will prompt you to apply the zero input signal, then measure and record the corresponding zero output signal current. Second, it does the same for the full-scale input signal and the corresponding full-scale output current signal. Note that as the span is reduced, resolution also diminishes. The Configuration Software will usually let you know when you need to adjust your desired limits as you enter them.

CAUTION: Input signal levels outside of the nominal input range of the unit will not be accepted for configuration of zero or full-scale. Since not all input levels can be validated during field programming, connecting or entering incorrect signals will produce an undesired output response.

Calibration Section

Input Calibration

Use this procedure to calibrate the selected input range.

1. Turn off CJC.
2. Select your Input Type and click the “Send Config” button.
3. Click on the Calibration-Input “Instructions” button.
4. Click on the “Zero” button.
5. Input the required voltage displayed in the pop-up box and click “OK”.
6. Click on the “Full Scale” button.
7. Input the required voltage displayed in the pop-up box and click “OK”.
8. Repeat steps 2-6 until all required input ranges have been calibrated. Note that some ranges are calibrated coincidentally. For example, Type K and Type N are calibrated by calibrating Type J. Type R and Type S are calibrated by calibrating by calibrating Type T.

Input Calibration Values For Supported Input Ranges

Available Input Ranges	INPUT CALIBRATION POINTS	
	LOW CALIBRATION POINT (Cal Lo)	HIGH CALIBRATION POINT (Cal Hi)
Type J TC	0.0° (0.000mV)	700.0° (39.130mV)
Type K TC	0.0° (0.000mV)	1300.0° (52.410mV)
Type N TC	0.0° (0.000mV)	1200.0° (43.846mV)
Type T TC	0.0° (0.000mV)	390.0° (20.255mV)
Type R TC	0.0° (0.000mV)	1700.0° (20.222mV)
Type S TC	0.0° (0.000mV)	1700.0° (17.947mV)
Type E TC	0.0° (0.000mV)	950.0° (72.603mV)
Type B TC	260° (0.317mV)	1700° (12.433mV)
±100 mVDC	-100.000 mVDC	100.000 mVDC

Output Calibration

Use this procedure to calibrate the 4-20mA output range endpoints

1. Turn off CJC.
2. Select your Input Type and click the “Send Config” button.
3. Click on the Calibration-Output “Instructions” button.
4. Click on the “Zero” button.
5. Input the required voltage displayed in the pop-up box and click “OK”.
6. Click on the “Full Scale” button.
7. Input the required voltage displayed in the pop-up box and click “OK”.

TRef Calibration

Use this procedure to calibrate the cold junction compensation.

1. First, calibrate the TC Type J input range as shown above.
2. Connect a TC Type J ice point reference to the device input terminals.
3. Click on the “Tref-Cal” button.
4. In the pop-up box, click “OK”.

CONFIGURATION SOFTWARE

Calibration

If your output appears imprecise, you may need to repeat calibration, but being very careful to take accurate measurements and to input the correct signal levels. If measuring voltage across the output load resistance, make sure that you use the exact input resistance when calculating the current measured. Also, make sure that you have an adequate input span, as too-tight input spans have diminished resolution and may magnify error.

CONFIGURATION STEP-BY-STEP

Calibration – Restore Factory Calibration

If you make an error in recalibration, such that the unit has degraded performance, then you can click the “Restore Factory Calibration” button to restore the unit to the original factory calibration. Note that doing so will not change/restore any configuration settings, only the range calibrations. You should only click the “Restore Factory Calibration” button if you ever mis-calibrate or misconfigure a transmitter in such a way that its operation appears erratic.

Other Configuration Controls

Reset ST13x Button

You can use **“Reset ST13x”** to reset the transmitter and cause it to revert to its power-up conditions (e.g. equivalent to a power-on reset). This might be useful if you ever encounter erratic operation.

Return to Out-of-Box Condition

You can use this button to restore the transmitter configuration to the original factory state (see Specifications Reference Test Conditions). This control provides a potential recovery path should the configuration ever become corrupted during recalibration, perhaps due to miscalibration. For example, if during calibration you break the USB connection before completing calibration, a memory transfer checksum value could be corrupted and this would inhibit normal operation. Alternately, this button can be used as a sanitation tool to restore the unit to its initial configuration. Note that the “Restore Factory Calibration” control of Calibration just affects the calibration of the unit, different from this control which sends the unit to its initial factory configuration and calibration. This button will restore **ALL** configuration settings and calibration to their original factory settings.

Message Bar

The system message bar at the bottom of the screen will display & repeat prompt instructions as you step through calibration. It also displays diagnostic messages. For example:

“No devices found”
“Connect a ST13x to a USB port.”
“Select a device from the drop down box above.”
“Unable to read from the device.”
“Interface Configured”
“Sending configuration, this takes several seconds.”
“Error encountered while sending configuration.”
“No error encountered while sending configuration.”
“Getting configuration, this takes several seconds.”
“Error encountered while reading configuration.”
“No error encountered while reading configuration.”
“No error encountered on read of input.”
“Error encountered on read of input.”
“Calibrating input zero, this takes several seconds.”
“Error occurred during calibration, try again.”
“Calibration successful.”
“Calibration cancelled.”
“Calibrating input full scale, this takes several seconds.”
“Calibrating output zero, this takes several seconds.”
“Calibrating output full scale, this takes several seconds.”
“Restoring factory calibration.”
“Error occurred during calibration restore, try again.”
“Restore successful”
“Restore cancelled”
“Restoring to “Out-of-Box” condition.”
“Error occurred during restore, try again.”
“”Out-of-Box” restore successful.”
“”Out-of-Box” restore cancelled.”
“Resetting ST13x.”
“Reset complete.”

SPECIFICATIONS

Model Numbers

Model ST132-0600
Signal Transmitter
TC Input
Non-Isolated
Two-Wire Loop-Powered
CE Approved Only
NO SIL Approvals

Model Number:

ST13/Input-Isolation/Power/Approvals/SIL-Calibration

ST13 is the model Series. The prefix “ST” denotes the “Smart Transmitter” family. The trailing “2” digit denotes an TC input type. The “0” after the hyphen denotes non-isolated, the “6” that follows denotes 2-wire loop powered. The “0” or “1” following denotes CE Approvals Only, or CE and UL/cUL Class 1, Division 2 Approvals. The last “0” digit refers to No SIL Approvals.

Note that ST132 models can be ordered with or without the factory configuration option. Factory configuration requires selection of input type (J, K, T, R, S, E, B, N, or ±100mV), filter control (Low, Med, or High), CJC Control (On, Off), I/O Scaling, and Sensor Fault Detection (Upscale or Downscale).

Default factory calibration settings are for Thermocouple Type J, upscale break, high filter and a 0° to 140°F (-17.78°C to 60°C) input span to drive a 4mA to 20mA output span. This calibration allows the product to be used as an Ambient Temperature Sensing amplifier. By jumpering the input plus to the input minus terminal, the unit may be used within panels and enclosures to transmit continuous ambient temperature data via the 4-20mA output.

Recalibration of any model will require use of an ST13C-SIP configuration kit ordered separately (see Accessories).

Analog Inputs

Models can be mounted in DIN Form B connection heads using the ST130-MTG mounting kit, or on DIN rail using the ST130-DIN kit. These kits are purchased separately (see Accessories)

Input: T/C or ±100mV Peak
Analog Inputs millivolt or thermocouple input channels per model. The Input of this unit can be configured to accept one of several input ranges below. The unit must be wired and configured for the intended input type and range (see Connections section for details). The following paragraphs summarize this model’s input types, ranges, and applicable specifications.

Thermocouple (See Table 1): Configurable for J, K, T, R, S, E, B, and N thermocouple types as shown in Table 1. Linearization, Cold-Junction Compensation (CJC), and lead break detection are included.

Table 1: Supported TC Types, Ranges, and Accuracy

TC	°C Temp Range	Typical[1,2] (of Full-Scale Span)	Typical (of Narrow Span)
J	-210 to +760°C	±0.1%	±0.5°C (Spans <= 500°C)
K	-200 to +1372°C	±0.1%	±0.5°C (Spans <= 500°C)
T	-260 to +400°C	±0.1%	±0.5°C (Spans <= 500°C)
R	- 50 to +1768°C	±0.1%	±1.0°C (Spans <= 1000°C)
S	- 50 to +1768°C	±0.1%	±1.0°C (Spans <= 1000°C)
E	-200 to +1000°C	±0.1%	±0.5°C (Spans <= 500°C)
B	+260 to 1820°C	±0.1%	±1.0°C (Spans <= 1000°C)
N	-230 to -170°C; -170 to +1300°C	±0.1% ±0.1%	±1.0°C (Spans <= 500°C) ±0.5°C (Spans <= 500°C)

Note 1 (Table 1): Accuracy is ±0.1% of the full-scale span, typical, or per narrow span specification, whichever is greater.
Note 2 (Table 1): Accuracy is given with CJC switched off. CJC inaccuracy must be added to the inaccuracy numbers in Table 1 to determine potential overall inaccuracy. Relative inaccuracy with CJC enabled may increase by as much as ±0.5°C during warm-up period, but will be ±0.2°C typical after five minutes.

SPECIFICATIONS

Analog Inputs

TC Input Reference Test Conditions: TC Type J with a 10mV minimum span (e.g. Type J with 200°C span); Ambient = 25°C; Power Supply = 24VDC; R-load = 250Ω.
TC Break Detection: Can be selected for Upscale or Downscale open sensor or lead break detection. Break detent selection cannot be disabled.
TC Input Bias Current: ±250nA typical (TC break).
Thermocouple Reference (CJC):

Table 2: CJC Sensor Accuracy

Temp Range	Typical	Max
25°C	±0.1°C	±0.3°C
10 to 80°C	±0.3°C	±0.6°C
-40 to 80°C	±0.5°C	±1.2°C

Input Gain: PGA gain is internally adjustable for 1, 2, 4, 8, 16, 32, 64, 128, 256, and 512 mV/mV.
Note: Cold Junction Compensation may be switched off to permit the direct connection of a mV source to the input for ease of calibration. For best results, allow the module to warm up for 15 minutes prior to calibrating CJC.
TC Linearization: Within ±0.25°C of the NIST tables.

DC Voltage (See Table 2): Can be configured for the bipolar DC voltage range of ±100mVDC.
Voltage Input Reference Test Conditions: ±100mV range with a 10mV minimum calibrated span; Ambient = 25°C; Power Supply = 24VDC; R-load = 250Ω.

General Analog Specification:
Input bias current: 250nA typical.
Voltage Input Reference Test Conditions: ±100mV input range with 10mV span; Ambient Temperature = 25°C.
Input Over-Voltage Protection: Bipolar Transient Voltage Suppressers (TVS), 5.6V clamp level typical.
Input Filter Bandwidth: -3dB at 57Hz, typical, normal mode filter.
Input Response Time: Output completes transition in less than 8 milli-seconds, typical.
Accuracy: TC accuracy is listed in Table 1. CJC accuracy is ±0.5°C (See Table 2). Voltage accuracy is better than ±0.05% of span. This includes the effects of repeatability, terminal point conformity, and linearization, but does not include sensor error.
Measurement Temperature Drift: Better than ±75ppm/°C (±0.0075%/°C).
Analog to Digital Converter (A/D): A 24-bit Σ-Δ converter.

SPECIFICATIONS

Resolution: Given in **Table 3** below per applicable range.

Input Range	Effective Resolution
±100mV DC	0.005% or 1 part in 20000
Thermocouples	0.1°C (0.18°F)

Input Conversion Rate:

Filter Level	Response Time (Typical)
None	<8 mS
Low	193 mS
Medium	515 mS
High	773 mS

Input Filter: Normal mode filtering, plus digital filtering optimized and fixed per input range within the Σ-Δ ADC.
Input Filter Bandwidth: -3dB at 57Hz, typical.
Noise Rejection (Normal Mode): 75 dB @ 60Hz,
Noise Rejection (Common Mode): 90 dB @ 60Hz

Resolution Specifications:
Input Resolution: The input stage depends on the range selected

Range	CAL HIGH		CAL LOW		HI Count	LO Count
J	700°C	39.132mV	0°C	0.000mV	49864	32768
K	1300°C	52.410mV	0°C	0.000mV	55661	32768
T	390°C	20.255mV	0°C	0.000mV	50464	32768
R	1700°C	20.222mV	0°C	0.000mV	50432	32768
S	1700°C	17.947mV	0°C	0.000mV	48446	32768
E	950°C	72.603mV	0°C	0.000mV	48626	32768
B	1700°C	12.433mV	260°C	0.317mV	54484	33322
N	1200°C	43.846mV	0°C	0.000mV	51920	32768
100mV	100mV	100mV	-100mV	-100mV	54613 /20000	10923/ -20000

Scaling Resolution: The scaling stage depends on the range selected.
Output Resolution: The output stage resolves to 1 part in 6546 for a 4 to 20mA output span. Note that input temp resolution is limited to 0.1°C (TC inputs). Thus, the effective resolution is controlled by the output stage for TC input spans greater than 655°C (resolves 1 part in 6546), or the input stage for TC input spans less than 655° (resolves to 0.1°C). For the millivolt input range, the effective resolution is controlled by the output stage (resolves to 1 part in 6546).

OUTPUT

Current Output Specifications:
Output: 4-20mA DC
Output Range: 4 to 20mA DC, 3.8 to 25mA range typical.
Output Ripple: Less than ±0.01% of output span.
Output Limiting: Output current is limited to less than 25mA, typical.
Output Compliance: 17V Minimum, 18V Typical, with a 24V supply and 20mA loop current.

SPECIFICATIONS

POWER

Power: 7-32VDC, SELV, 30mA Max. Class 2
Output Power Supply: 7-32V DC SELV (Safety Extra Low Voltage), 30mA maximum. The supply voltage across the transmitter must not exceed 36V, even with a shorted load. The supply voltage level must be chosen to provide a minimum of full-scale current to the load (0.020*R typical), plus 7V minimum to the transmitter terminals, plus any line drop. Reverse polarity protection is included, as output terminals are bridge coupled and not polarized. The ± output polarity labels on the enclosure are for reference only.
CAUTION: Do not exceed 36VDC peak to avoid damage to the unit. Terminal voltage at or above 7V minimum must be maintained across the unit during operation.

Input to Output Response Time:

Filter Level	Response Time (Typical)
None	<8 mS
Low	200 mS
Medium	550 mS
High	800 mS

For a step change in input signal, the output reaches 98% of final value with a 250Ω load.
Power Supply Effect: Less than ±0.05% of output span effect per volt DC change.

USB Interface

USB Interface

Includes a USB socket for temporary connection to a PC or laptop for the purpose of setup and reconfiguration. During reconfiguration and calibration, the transmitter receives power from both the USB port and the output loop--both power sources must be present to calibrate the unit.
CAUTION: Do not attempt to connect USB in a hazardous environment. Transmitter should be setup and configured in a safe environment only.
Data Rate: USB v1.1 full-speed only, at 12Mbps. Up to 32K commands per second. USB 2.0 compatible. Consult factory for a low speed (1.5Mbps) version if required.
Transient Protection: Unit includes transient voltage suppression on USB power and data lines.
USB Connector: 5-pin, Mini USB B-type socket, Molex #5000751517.

PIN	DEFINITION
1	+5V Power (Includes Inrush Current Limiting)
2	Differential Data (+)
3	Differential Data (-)
4	NC – Not Connected
5[1]	Power Ground (Connects to Signal Ground via ferrite bead)
SHLD[1]	Signal Ground (Connects directly to Signal Ground)

[1]**Note:** Most Host Personal Computers (except battery powered laptops) will connect earth ground to the USB shield and signal ground.

Inrush Current Limiting: Unit includes series inrush current limiting at its USB power connection.
Cable Length/Connection Distance: 5.0 meters maximum.
Driver: Not required. Transmitter uses the built-in Human Interface Device (HID) USB drivers of the Windows Operating System.

SPECIFICATIONS

Enclosure and Physical

Enclosure & Physical

General purpose plastic enclosure intended to be mounted in DIN Form B connection heads. Optionally, a DIN rail adapter is available for mountable to 35mm "T-type" DIN rail, or G-Type DIN rail.
Dimensions: Diameter = 44.5mm (1.752 inches), Height = 23.4mm (0.921 inches). Refer to Mechanical Dimensions drawing. Conforms to DIN 43 729 Form B size requirements.
I/O Connectors: Barrier strip type, captive screw terminals; wire range: AWG #14-28 solid or stranded.
Program Connector: USB Mini B-type socket, 5-pin.

Case Material: Self-extinguishing polycarbonate ABS plastic, UL94 V-0 rated base material, color blue. USB dust cap material is Santoprene, 251-70W232, color red.
Terminal Material: Captive 4-40 threaded steel screw and 0.040 inch thick Phosphor-Bronze terminal material.
Circuit Board: Military grade fire-retardant epoxy glass per IPC-4101/98 with humi-seal conformal coating.
DIN-Rail Mounting: The unit can be optionally mounted to 35x15mm, T-type DIN rails using optional ST130-DIN DIN-rail mounting adapter kit. Refer to the Mounting & Dimensions section for more details.
Shipping Weight: 0.5 pounds (0.22 Kg) packed.

Agency Approvals

Safety Approvals: Model ST132-0610 is UL Listed (USA & Canada) suitable for use in Class I, Division 2, Groups A, B, C, D Hazardous Locations, or Nonhazardous Locations only.

ATEX Certified

ATEX Certified: Model ST132-0610 is ATEX Certified for Explosive Atmospheres per ATEX Directive 94/9/EC which complies with standards BS EN 60079-0:2012 & BS EN 60079-15:2010.
Ⓔx II 3 G Ex nA IIC T4 Gc -40°C ≤ Ta ≤ +80°C
DEMKO 13 ATEX 1113348X
X = Special Conditions

1) Must be installed in an ATEX Certified enclosure with a minimum ingress protection rating of at least IP54 and used in an environment of not more than pollution degree 2.
2) Enclosure must have a door or cover accessible only by the use of a tool.
3) Provisions shall be made to prevent the rated voltages from being exceeded by the transient disturbances of more than 140% of the peak rated voltage.

Environmental

Environmental

These limits represent the minimum requirements of the applicable standard, but this product has typically been tested to comply with higher standards in some cases.

Operating Temperature: -40°C to +80°C (-40°F to +176°F).
Storage Temperature: -40°C to +85°C (-40°F to +185°F).
Relative Humidity: 5 to 95%, non-condensing.
Isolation: Input & output are not isolated from each other for this model. Model is intended to interface with insulated/non-grounded sensors.
Installation Category: Suitable for installation in a Pollution Degree 2 environment with an Installation Category (Over-voltage Category) II rating per IEC 1010-1 (1990).

SPECIFICATIONS

Operating Shock & Vibration Immunity: Sinusoidal Vibration: 5G, 5-500 Hz, in 3 axis at 2 hours/axis per IEC60068-2-6. Random Vibration: 5G-rms, 5-500 Hz, in 3 axis at 2 hours/axis per IEC60068-2-64. Mechanical Shock: 30g at 11ms half-sine shock pulses and 50g at 3ms half-sine shock pulses in each direction along 3 axis (18 shocks), per IEC60068-2-27.

Electromagnetic Interference Immunity (EMI): The transmitter output has demonstrated resistance to inadvertent output shifts beyond ±0.25% of span, under the influence of EMI from switching solenoids, commutator motors, and drill motors.

EMC – CE Marked

Electromagnetic Compatibility (EMC): CE marked, per EMC Directive 2004/108/EC.

Immunity per BS EN 61000-6-1:

1) Electrostatic Discharge Immunity (ESD), per IEC 61000-4-2.
2) Radiated Field Immunity (RFI), per IEC 61000-4-3.
3) Electrical Fast Transient Immunity (EFT), per IEC 61000-4-4.
4) Surge Immunity, per IEC 61000-4-5.
5) Conducted RF Immunity (CRFI), per IEC 61000-4-6.

Emissions per BS EN 61000-6-3:

1) Enclosure Port, per CISPR 16.
2) Low Voltage AC Mains Port, per CISPR 14, 16.
3) DC Power Port, per CISPR 16.
4) Telecom / Network Port, per CISPR 22.

Note: This is a Class B product.

Reliability Prediction

Reliability Prediction

MTBF (Mean Time Between Failure): MTBF in hours using MIL-HDBK-217F, FN2. *Per MIL-HDBK-217, Ground Benign, Controlled, GBGC*

Temperature	ST132-06X0
25ºC	3,283,706 hrs
40ºC	2,099,253 hrs

Configuration Controls (Software Configuration Only via USB)

This transmitter produces an analog output current proportional to a sensor input based on the voltage measured across the sensor. No switches or potentiometers are used to make adjustments to this transmitter. Its analog output level and behavior is instead determined via register values stored in non-volatile Flash memory in the transmitter. The contents of these registers are automatically uploaded at power-up and will determine excitation, amplifier gain, zero offset, linearization, and other options of the embedded ASIC. The contents of these registers are programmed using a temporary USB connection to a host computer or laptop running a Windows-compatible configuration software program specific to the transmitter model. This software provides the framework for digital control of the contents of these registers.

Refer to Configuration Step-by-Step of this manual for detailed information on available software control of this model.

ACCESSORIES

Software Interface Package/Configuration Kit – Order ST130-SIP

- USB Signal Isolator
- USB A-B Cable 4001-112
- USB A-mini B Cable 4001-113
- Configuration Software CDROM 5039-312

This kit contains all the essential elements for configuring ST130 Smart Transmitters. Isolation is recommended for USB port connections to these transmitters and will block a potential ground loop between your PC and a grounded current loop. A software CDROM is included that contains the Windows software used to program the transmitter.

Transmitter Mounting Kit – Order ST130-MTG

- M4 Mounting Screw 1010-456, 2pcs
- 6-32 Mounting Screw 1010-443, 2pcs
- Relief Spring 1011-358, 2pcs

This kit contains two M4 mounting screws and relief springs for mounting this transmitter in DIN Form B Connection Heads. Two 6-32 screws are included for non-compliant DIN Form B Connection Heads with English threads. The screws in this kit are of a special design that is semi-captive to the ST130 enclosure. Order 1 kit per transmitter.

USB Isolator – Order USB-ISOLATOR

- USB Signal Isolator
- USB A-B Cable 4001-112
- Instructions 8500-900

This kit contains a USB isolator and a 1M USB A-B cable for connection to a PC. This isolator and cable are also included in ST131C-SIP (see above).

USB A-B Cable – Order 4001-112

- USB A-B Cable 4001-112

This is a 1 meter, USB A-B replacement cable for connection between your PC and the USB isolator. It is normally included with the ST13C-SIP Software Interface Package and also with the isolator model USB-ISOLATOR.

USB A-mini B Cable – Order 4001-113

- USB A-mini B Cable 4001-113

This is a 1 meter, USB A-miniB replacement cable for connection between the USB isolator and the ST130 transmitter. It is normally included in ST13C-SIP.

ACCESSORIES

Series ST DIN Rail Adapter – Order ST130-DIN

- DIN Rail Adapter 1027-187
- M4 Mounting Screw 1010-456, 2pcs
- Relief Spring 1011-358, 2pcs

This is a DIN rail bracket with mounting screws that connect to the ST130 Smart Transmitter to allow it to be snapped onto 35mm T-type DIN rail, or G-type DIN Rail. The screws and springs of this kit are identical to those provided in the Transmitter Mounting Kit ST13C-MTG.

NOTES:

Revision History

The following table shows the revision history for this document:

Release Date	Version	EGR/DOC	Description of Revision
03 DEC 13	J	ARP/FJM	Change the Default State Configuration (ECN 13L001). (11/20/13: 8500895J was incorrectly revised to K on ECN 13L001.)