



Title

# 1 CHANNEL TEMPERATURE TRANSMITTER TYPE SILBUS-TX1T

## USER MANUAL

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# 05





## REVISION CONTROL

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## 1 GENERAL DESCRIPTION

The single channel temperature transmitter is part of a family of explosion protected DIN rail mounting modules that transmit to and receive from an Austdac SILBUS field bus network. The SILBUS-TX1T can transmit a single temperature value on an independent valid SILBUS channel.

The single temperature input is designed to work with a standard two, three or four wire PT100 temperature sensor. The temperature transmitter can be configured to operate on one of two temperature ranges,  $-10^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$  or  $-20^{\circ}\text{C}$  to  $+200^{\circ}\text{C}$ . This makes the SILBUS-TX1T particularly suited to monitoring bearing or similar plant temperatures via the SILBUS network without any requirements for additional power.

The transmitter is housed within a DIN rail mounting enclosure measuring 45mm (W) x 75mm (H) x 110mm (D). The front panel is located between the two top of enclosure mounted terminal blocks to provide a clear view of the operation indicating LED. A single LED is provided to show SILBUS network status.

The SILBUS-TX1T can be quickly and simply configured using a laptop computer running Hyper Terminal and a small plug in programming adaptor. The single temperature input can be programmed to any SILBUS channel address. The temperature input can also have it's over range, hysteresis, digital set point alarm channels and analogue transmission protocol configured by the user.

## 2 WARNINGS AND PRECAUTIONS

### WARNING

- The red "RUN/PROG" switch (see Photograph 2) next to the console port connector should be in the run position (pushed towards console port connector) at all times.
- If PT100 has a foil sheath then this should be connected with pin 12 to earth. It **should not** be connect to return ground pin 10, this pin is allocated for the return current of the PT100.
- If the SILBUS-TX1T is used in a manner not specified by Austdac then the protection provided by the SILBUS-TX1T may be impaired.

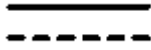
### PRECAUTIONS

- Only qualified personnel shall install and service the SILBUS-TX1T.
- Mains supply fluctuations are not to exceed  $\pm 10\%$  of the nominal supply voltage.

## SYMBOLS



AC SUPPLY



DC SUPPLY



EARTH

### 2.1 USER ACCESS

There are no user serviceable parts within the SILBUS-TX1T. The user should not open or disassemble the SILBUS-TX1T.

### 2.2 STORAGE, INSTALLATION, USE AND MAINTAINANCE REQUIREMENTS

The SILBUS-TX1T should only be installed, operated and maintained by qualified personnel in accordance with the condition of safe use as outlined in the certificate.

Ensure that all instructions and warnings are observed.

#### 2.2.1 Storage

The specified storage temperature must be maintained during storage.

#### 2.2.2 Installation and conditions of use

Prior to installation the SILBUS-TX1T should be inspected for the following;

- Any external damage to the enclosure.

The SILBUS-TX1T may be installed in any orientation.

The SILBUS-TX1T must be installed in a suitably certified IP54 or better enclosure or as required by legislation. The enclosure should provide adequate protection, from impact and ingress of dust and water.

The SILBUS-TX1T should be mounted to a stable surface avoiding areas under constant vibration and shock.

### 3 FRONT PANEL LAYOUT

The SILBUS-TX1T front panel is located between the terminal blocks that form part of the enclosure. The front panel is shown in photograph 1 below.



**Photograph 1 SILBUS-TX1T front panel**

Located in the top right hand corner of the front panel is the yellow STATUS indication LED. The yellow status LED flashes at different rates to indicate the operational status of the transmitter, see table 1 for more details.

The front panel can be snapped out and removed by using a wide bladed flat screw driver to gain access to the configuration (console) port and programming switch. Photograph 2 below shows the front panel removed and the location of the console port and programming switch.



**Photograph 2 Access to console port and programming switch**

The black four pin console port connector and the red programming switch are located behind the upper left corner of the front panel label. The red programming switch selects the mode the unit is in, either “RUN” or “PROG” mode. You must always be in “RUN” mode for unit to operate correctly. “PROG” mode is used to configure the unit when no SILBUS network power is available.

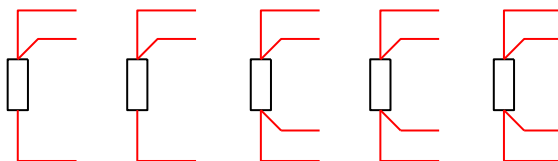
## **4 THEORY OF OPERATION**

The single channel temperature transmitter takes a single input from a PT100 sensor and transmits it onto the connected SILBUS network using either the ANALINK or FASTLINK protocols. The temperature input is converted to a sixteen bit (Fastlink) or eight bit (Analink) value ready for transmission on the configured SILBUS channel. The analogue transmission protocol can be configured for the temperature input. See Austdac document 120-009-10 for a more detailed description of SILBUS communications.

The PT100 sensor is a two, three or four wire resistor that varies its resistance according to the surrounding temperature. The sensor has a resistance of 100Ω at 0°C. The sensor resistance increases with temperature. The PT100 sensor will work with 2 wires but the resistance of the sensor leads also contribute to the change in resistance and introduce errors. Three and four wire sensors provide Kelvin connections that allow for the lead resistance errors to be compensated out of the final temperature reading. The SILBUS-TX1T carries out three-wire lead compensation on three and four-wire sensors, two-wire sensors will work with the transmitter but no compensation is possible. Use three or four-

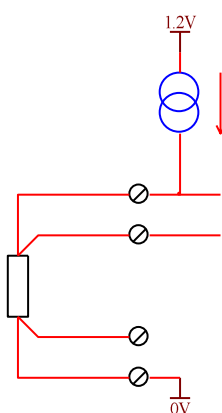


wire sensors for better accuracy. The figure below shows three and four wire PT100 sensors and typical lead identifications.



**Figure 1 PT100 sensors and typical lead identifications**

The SILBUS-TX1T temperature transmitter functions by driving a constant current of 200uA out of terminal 8 through the PT100 sensor and back in through terminal 11. This current will cause a voltage to appear across the sensor proportional to the sensor temperature.



**Figure 2 Sensor input schematic**

The sensor voltage and therefore temperature is measured at terminal 9 of the transmitter.

SILBUS-TX1T TEMPERATURE VS. INPUT VOLTAGE		
TEMPERATURE °C	SENSOR RESISTANCE Ω	INPUT VOLTAGE mV
-20	92	18.4
-10	96	19.2
0	100	20.0
+10	104	20.8
+20	108	21.6
+30	112	22.4
+40	115	23.0
+50	119	23.8
+100	138	27.6
+150	157	31.4
+200	176	35.2

**Table 1 SILBUS-TX1T Temperature vs. Input voltage**

The sensor voltage at terminal 9 does not include any error voltages introduced by the lead from terminal 8 to the sensor. The sensor voltage at 0°C is 20mV.

The table above shows some typical temperatures, sensor resistances and SILBUS-TX1T input voltages.

The temperature input is also monitored for under and over temperature by comparing it to configured set points. The under or over temperature can be transmitted as a digital signal on any valid configurable SILBUS channel address. A hysteresis level can be configured for each input to stop the set point alarms from chattering because of noise on the temperature signal from the sensor.

All configurable aspects of the temperature transmitter can be programmed via the console port. The transmitter will operate with 8, 16, 32, 64 and 128 channel SILBUS networks and will automatically configure to the number of channels of the connected SILBUS network.

## 5 OPERATING INSTRUCTIONS

The single channel temperature transmitter does not require any operator action to operate once it has been installed within an IP54 host enclosure and configured correctly.

An understanding of the various flash sequences of the yellow status LED may be required to help in the trouble shooting and maintenance of the entire SILBUS network installation. The status LED provides information on the operational status of the transmitter and the connected SILBUS network. This information includes correct microprocessor operation and health of connected SILBUS network. The table below shows the various flash sequences and their meaning.

STATUS LED FLASH SEQUENCES		
FLASH SEQUENCE	NAME	MEANING
NONE – LED ON OR OFF CONTINUOUSLY	NO FLASH	INTERNAL MICROPROCESSOR FAULT OR NO POWER.
QUICK FLASH EVERY 1.36mS	FAST FLASH	TRANSMITTER FUNCTIONING HEALTHY SILBUS

**Table 2 Status LED flash sequence meanings**

The console port power source selection switch SW1 must always be in the run position for correct operation of the transmitter. The run position is with the small slide actuator pushed closest to the black four pin console connector X1.

## 6 CONFIGURATION

The single channel temperature transmitter has several operational parameters that require configuration prior to use. All of these parameters can be viewed and changed via the console port. The console port consists of a small four pin connector and a two position slide switch behind the front panel label. Access to the console port can be gained by snapping out the front panel using a wide bladed flat screw driver in one of the slots between the front panel and terminal blocks.

To use the console port an Austdac MEAN1 interface, A to B USB cable and laptop computer running Hyper Terminal or any other console program is required.

For more detail on the console port, MEAN1 interface and their use refer to Austdac document 53-018-11.

## 6.1 CONSOLE PORT OPERATION

The console port should be connected to a laptop running a terminal emulation program such as Hyper Terminal via the Austdac interface type MEAN1 and a USB cable as shown in the following photograph.



**Photograph 3 Laptop connected to console port via MEAN1 interface**

The SILBUS-TX1T certification places restrictions on what may be connected to the console port, the connection of an interface other than the Austdac MEAN1 to the console port will invalidate the certification of the transmitter.

The terminal emulation program should be configured to 19200 baud, 8 data bits, one stop bit, no parity, no flow control and DEC VT100 terminal emulation.

Once communications have been established with the SILBUS-TX1T, it will display a screen of information that includes software version, software checksum, and a list of commands followed by the console port prompt.

The prompt includes an abbreviation of the transmitter type number. **TX1T : : >**

Commands are invoked by entering the command name followed by any optional modifiers, keywords and the “ENTER” key. The enter key is shown in the following examples as a “↵” symbol.

Note: The red "RUN/PROG" switch (see Photograph 2) next to the console port connector should be in the run position (pushed towards console port connector) at all times. When in "RUN" mode, for the console port to operate, the SILBUS network needs to be connected to the SILBUS port. The TX1T will take 10-20 seconds to respond to the connecting of the console port cable, as it has to change modes. When in console port configuration mode, no SILBUS operation can take place. Alternatively without SILBUS network power, you can configure the TX1T in "PROG" mode (switch away from console port connector - as labelled) using the MEAN1 3.3V power source with the CPP switched on. This can be done away from a SILBUS network or when commissioning the system without SILBUS power on. You **must** place it back into "RUN" mode or the TX1T will not work after the configuration.

## 6.2 HELP COMMAND

The HELP command prints a list of all available commands and shows the syntax for each command. Optional command modifiers are shown within [ ] while mandatory modifiers are shown within < >. An example of a screen output follows:

```
TX1T::>help
Software 1V04 0x0D5C Configuration 0x4BE4 SN:15065498
Commands:
-----
                ***** Level 1: Standard Menu *****
HELP           [1..7] Level of Help                Display Help Menu
REPEAT         [LF] [Refresh rate in seconds]      Repeat Previous Command
VER            Firmware Version and Checksum
STACK          Display Peak Stack Usage
SBADDR        [<SET> <A1-P8,DISABLE>]             Temperature SILBUS Address
FSTMRK        [<SET> <A1-P8,DISABLE>]             Set Fastlink Marker Address
ANASEL        [<SET> <AnaInk|FstInk>]             Analog Protocol for Temperature
ADDPT         [<SET> <A1-P8> <FALL|RISE> <Temp>]  Add Temperature Trip Points
DELPT         [<SET> <Number | all>]              Deletes Temperature Trip Points
FLTHYS        [<SET> <degC>]                      Trip Clear Hysteresis Value
RANGE         [<SET> <Normal|Wide>]              Normal -10to100, Wide -20to200
TEMP          Display Temperature in degC
CFGUP         Upload Configuration Text
CFGDWN        Download Configuration Text
-----
```

```
TX1T::>
```

## 6.3 REPEAT COMMAND

The REPEAT command is used after another command to continuously repeat that command. As an example, the TEMP command can be executed followed by the REPEAT command to provide a continuously updating display of the selected SILBUS channel. The display will continue to update until any key is hit. The TX1T will respond by displaying the prompt.

```
TX1T::>TEMP ↵
Temperature = 0.1degC
```

```
TX1T::>REPEAT↵
```

```
Temperature = 0.1degC
```

In the above example, in this mode the repeat command writes over the previously displayed information. If required, the repeat command can be made to refresh the information on a new line by entering LF (line feed) as part of the command invocation. By default, the repeat command refreshes the display every one second. The refresh rate can be slowed by entering the refresh rate in seconds as part of the repeat command as shown in the following command:

```
TX1T::>REPEAT LF 5 ↵
```

```
Temperature = 0.1degC
```

```
Temperature = 0.1degC
```

```
...continues until return (↵) is pressed.
```

```
↵
```

```
TX1T::>_
```

As can be seen from the above example, the repeat command refreshed the status of the temperature value every five seconds. In the LF mode, a record of the temperature status can be viewed on the console screen.

## 6.4 VERSION COMMAND

The VERSION command is used to display the serial number, abbreviated type number, software version, program memory checksum and configuration checksum of the TX1T.

The command can be invoked as shown in the following example:

```
TX1T::>VER ↵
```

```
TX1T Software 1V03 0x0D5C Configuration 0xFFFF6 SN:09124321
```

```
TX1T::>_
```

This command is useful when the user needs to know the software version or serial number. The program memory checksum is useful to confirm that a software update has completed successfully without any programming errors.

## 6.5 STACK COMMAND

The STACK command is provided to allow the technician to gauge the health of the TX1T microprocessor and its code by displaying the maximum usage of the program stack. The display is a peak value of the stack usage since the TX1T was powered up. The command can be invoked as shown in the example below:

```
TX1T::>STACK ↵
```

```
Stack usage/size = 312/1024
```

```
Percentage Used = 30%
```

```
TX1T::>_
```

This command would typically only be used when requested by an Austdac software engineer.

## 6.6 TEMPERATURE INPUT ADDRESS COMMAND

This command is used to display and configure the SILBUS channel address of the temperature input of the SILBUS-TX1T. The current SILBUS channel can be displayed by simply entering the command name as shown in the example below:

```
TX1T::>SBADDR ↵  
Temperature Address = A6
```

```
TX1T::>_
```

If the command name is entered with additional attributes the channel address can be configured to any valid SILBUS address. There is no restriction on the SILBUS address.. An example of configuring input 2 is shown below:

```
TX1T::>SBADDR SET K7 ↵  
Setting Changed  
Temperature Address = K7
```

```
TX1T::>_
```

The above example shows the format of the command when the temperature address is configured. The keyword “SET” is required to invoke a change; followed by the SILBUS channel address for the temperature. The keyword “DISABLE” is used when a SILBUS channel is not required for the temperature signal, but the end user may still wish to use the trip alarm signals (see section 5.12).

```
TX1T::>SBADDR SET DISABLE ↵  
Setting Changed  
Temperature Address = --
```

```
TX1T::>_
```

## 6.7 FASTLINK MARKER COMMAND

This command is used to display and configure the FASTLINK marker SILBUS channel address. A valid FASTLINK marker is required whenever the temperature input is configured to transmit using the FASTLINK protocol. The marker is generated by the GSW1 channel generator and can be any valid SILBUS channel address. Only one marker is required per SILBUS field bus network. The current marker channel address can be displayed by simply entering the command name as shown in the example below:

```
TX1T::>FSTMRK ↵  
Fastlink Marker is A3
```

```
TX1T::>_
```

The example below shows the format of the command when the marker address is configured. The keyword “SET” is required to invoke a change, followed by the SILBUS channel address of the FASTLINK marker. If FASTLINK is not to be used by the TX1T transmitter then the marker channel should be disabled. The keyword “DISABLE” is used when the marker channel is not required.

```
TX1T::>FSTMRK SET DISABLE ↵
```

```
Setting Changed
```

```
Fastlink Marker is DISABLE
```

```
TX1T::>_
```

## 6.8 ANALOGUE PROTOCOL SELECT COMMAND

This command is used to display and configure the analogue transmission protocol for the temperature input. The temperature input can be configured to either Analink or Fastlink transmission protocol. The current selected transmission protocol can be displayed by simply entering the command name as shown in the example below:

```
TX1T::>ANASEL ↵
```

```
Temperature SILBUS Analog Protocol = Analink
```

```
TX1T::>_
```

If the command name is entered with additional attributes the analogue transmission protocol can be configured to Fastlink or Analink for the temperature input. An example of configuring the protocol is shown below:

```
TX1T::>ANASEL SET FASTLINK ↵
```

```
Setting Changed
```

```
Temperature SILBUS Analog Protocol = Fastlink (Marker Error)
```

```
TX1T::>_
```

The ‘marker error’ has been displayed because the temperature input has been configured to Fastlink but a valid Fastlink marker channel address has not been specified. See the Fastlink marker command (FSTMRK) for details on assigning a valid marker address. Refer to Austdac document 120-009-10 for more detail on the various analogue and data transmission protocols. Once a valid marker address has been configured the error message will disappear as shown in the example below.

```
TX1T::>ANASEL ↵
```

```
Temperature SILBUS Analog Protocol = Fastlink
```

```
TX1T::>_
```

## 6.9 TRIP POINT ADD COMMAND

This command is used to display and configure the SILBUS channel addresses, direction and level of the trip point alarms of the SILBUS-TX1T. The trip alarms are generated when the temperature input passes a preconfigured rising or falling trip point level. Up to

five trip point alarms can be assigned to the temperature input. The current configuration of the set points can be displayed by simply entering the command name as shown in the example below:

```
TX1T::>ADDPT ←  
No Limit Points
```

```
TX1T::>_
```

The above example shows that no set points have been configured. If the command is entered with additional attributes more set points can be added to the configuration up to the upper limit of five set points. There is no restriction on the SILBUS addresses; they do not have to be in numerical order or from the same group. An example of adding a new set point is shown below:

```
TX1T::>ADDPT SET J2 RISE 85 ←  
Setting Changed  
1: J2 Trips on a rising edge at 85.0degC
```

```
TX1T::>_
```

The above example shows the adding of a set point to the temperature input. The keyword “SET” is required to invoke an addition; the address of the SILBUS digital channel is next, followed by the keyword “RISE” and the value of the set point level in degrees C.

```
TX1T::>ADDPT SET J3 FALL 65.1 ←  
Setting Changed  
1: J2 Trips on a rising edge at 85.0degC  
2: J3 Trips on a falling edge at 65.1degC
```

```
TX1T::>_
```

The above example shows the adding of a second set point to the temperature input. The keyword “SET” is required to invoke an addition; the address of the SILBUS digital channel is next, followed by the keyword “FALL” and the value of the set point level in degrees C.

## 6.10 SET POINT DELETE COMMAND

This command is used to display or delete set points from the temperature input. The current configuration of the set points can be displayed by simply entering the command name as shown in the example below:

```
TX1T::>DELPT ←  
1: J2 Trips on a rising edge at 85.0degC  
2: J3 Trips on a falling edge at 65.1degC
```

```
TX1T::>_
```

The use of the set point delete command without any attributes does not delete any set points.



```
TX1T::>DELPT SET 1 ↵
```

**Setting Changed**

**1: J3 Trips on a falling edge at 65.1degC**

```
TX1T::>_
```

The above example shows the deletion of the first set point. The keyword “SET” is required to invoke the deletion. The number “1” specifies which set point to delete. Note that remaining set points are renumbered after execution of the delete command. The next example shows the use of the keyword “ALL” with the delete set point command.

```
TX1T::>DELPT SET ALL ↵
```

**All points deleted**

```
TX1T::>_
```

### 6.11 TRIP SET POINT HYSTERESIS COMMAND

This command is used to display and configure the common set point hysteresis for the temperature input. The hysteresis value is used to stop the set point alarms from switching on and off with any noise that may be present on the temperature input signal. For example if the temperature input was currently at 64.9°C and the set point level was set at 65°C for a rising alarm, the input signal would only need slightly more than 0.01°C of noise or jitter to cause the set point alarm to randomly switch on and off. By setting the hysteresis value to slightly higher than any known noise this random and annoying switching can be eliminated. The hysteresis value is common to all setpoints. The current hysteresis value can be displayed by simply entering the command name as shown in the example below:

```
TX1T::>TRPHYS ↵
```

**Hysteresis level 0.5degC**

```
TX1T::>_
```

If the command name is entered with additional attributes the hysteresis level can be configured to any valid level. An example of configuring the hysteresis level is shown below:

```
TX1T::>TRPHYS SET 0.3 ↵
```

**Setting Changed**

**Hysteresis level 0.3degC**

```
TX1T::>_
```

The range of the hysteresis is from 0.1°C to 10°C.

### 6.12 TEMPERATURE INPUT COMMAND

The temperature input command is used to display the current value of the temperature input. This command can only be used if SILBUS or 9V battery is connected to SILBUS port. If power is not connect the following message will appear:

**TX1T::>Error: No Silbus connected. Use Silbus or a 9V Battery**

The example below shows the temperature being displayed when SILBUS is present:

```
TX1T::>TEMP ↵
Temperature = 110.4degC
```

```
TX1T::>_
```

### 6.13 RANGE COMMAND

The range command is used to select the measurement range of the SILBUS-TX1T temperature transmitter. The example below shows the temperature being displayed:

```
TX1T::>RANGE ↵
Temperature range is normal
```

```
TX1T::>_
```

The SILBUS-TX1T has two temperature measurement ranges labelled normal and wide. These ranges are shown in the following table.

SILBUS-TX1T TEMPERATURE MEASUREMENT RANGES	
NAME	TEMPERATURE RANGE
NORMAL	-10°C to +100°C
WIDE	-20°C to +200°C

**Table 3 SILBUS-TX1T Temperature ranges**

The example below shows how the range command can be used to configure the temperature measurement range:

```
TX1T::>RANGE SET WIDE ↵
Setting Changed
Temperature range is wide
```

```
TX1T::>_
```

### 6.14 UPLOAD CONFIGURATION COMMAND

The upload configuration command is used to extract the configuration profile of the SILBUS-TX1T via the MEAN1 interface and record it in a file on a PC. Having an exact copy of the configuration is useful for record keeping and future cloning of new SILBUS-TX1T transmitters for maintenance or system expansion. The upload is invoked by entering the command name without any attributes as shown in the example below.

```
TX1T::>CFGUP ↵
CFGDWN
S00300000FC
S11300000000001001022E008056000105000000CF
S1130010800000000800000008000000080000000DC
S11300208000140008001E00090028000A000000D7
```

```
S11300308000000800000006492000011002ED9AE
S9030000FC
```

```
TX1T::>_
```

The configuration is uploaded and displayed on the screen in Motorola S1-S9<sup>®</sup> HEX format. This data format includes headers and checksums to guard against errors and corruption of the data. The first line of the uploaded configuration is the keyword “CFGDWN” this does not form part of the data but is included to help with the configuration download process, see section 5.17 below for details.

To save the configuration to a file, open Notepad or a similar non-word processing editor, highlight the uploaded configuration as indicated below and copy to Notepad via the clipboard. The Notepad file should then be saved with a meaningful title that reflects the application e.g. TX1T\_xxx.CFG. When highlighting the uploaded configuration, ensure that the invisible carriage returns (CR) at the end of all lines are included. Also ensure that the CFGDWN keyword is included.

```
TX1T::>CFGUP ←
```

```
CFGDWN
S0030000FC
S1130000000001001022E008056000105000000CF
S11300108000000080000000800000008000000DC
S11300208000140008001E00090028000A000000D7
S113003080000000800000006492000011002ED9AE
S9030000FC
```

```
TX1T::>_
```

The copy and paste method is used in this manual because it is the most universal method that works with all terminal emulation programs such as HyperTerminal<sup>®</sup>. Do not use an editor that introduces hidden formatting characters as a future download may not work with these characters in place. Many terminal emulation programs have automatic means to upload the configuration directly into a file; these are not described here as they differ from program to program but there is no restriction on using these features. Austdac is planning to release a complete tool to allow direct upload, download and editing of the configuration profile.

## 6.15 DOWNLOAD CONFIGURATION COMMAND

The download configuration command is used to take a previously saved configuration from a file and download it to the target SILBUS-TX1T transmitter. This method of configuration ensures exact cloning during maintenance and system expansions.

Communications with the target must first be established via the MEAN1 interface and a terminal emulation program such as Hyper Terminal<sup>®</sup>. The cursor should be left at the SILBUS-TX1T prompt as follows.

```
TX1T::>_
```

Open the previously saved configuration file in Notepad or a similar non-word processing editor and highlight the configuration as shown below.

```

CFGDWN
S00300000FC
S11300000000001001022E008056000105000000CF
S11300108000000080000000800000008000000DC
S11300208000140008001E00090028000A000000D7
S113003080000000800000006492000011002ED9AE
S9030000FC

```

Copy and paste the configuration from Notepad to the TX1T::> prompt in Hyper Terminal as shown below. Note CTRL-V does not work in Hyper Terminal.

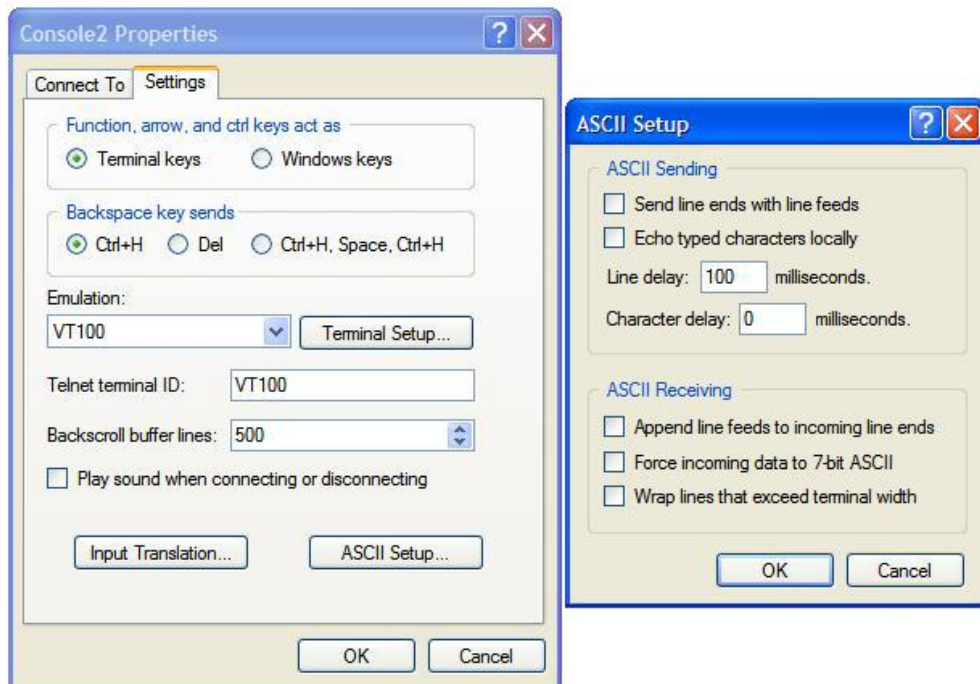
```

TX1T::>CFGDWN
S00300000FC
S11300000000001001022E008056000105000000CF
S11300108000000080000000800000008000000DC
S11300208000140008001E00090028000A000000D7
S113003080000000800000006492000011002ED9AE
S9030000FC↵

```

TX1T::>\_

The first line of the configuration contains the keyword “CFGDWN” which instructs the target to accept the data records. This “CFGDWN” keyword should have been copied from a previous upload and saved in the configuration file. Automatic file transmission features of the terminal emulation program may be used to download configuration files.



Photograph 4 Hyper Terminal delay setup

The terminal emulation program should be set up to allow a 100mS wait period after the carriage return at the end of each line during a download, this gives the target time to process the incoming data.

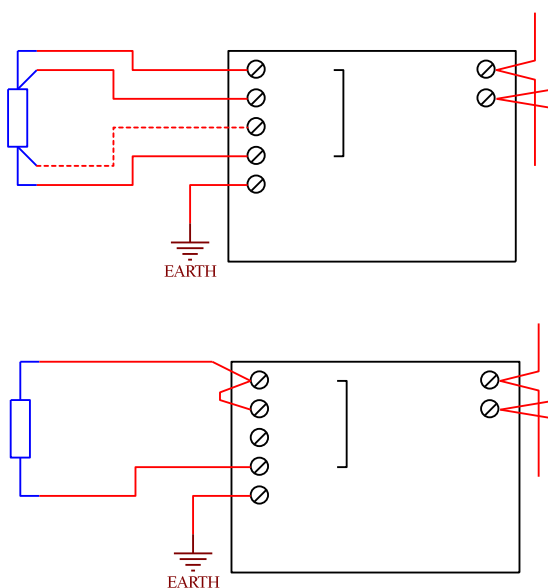
The following table may be used to record the configuration of the SILBUS-TX1T single channel temperature transmitter.

SILBUS-TX1T CONFIGURATION RECORD	
LOCATION	
SILBUS NETWORK	
TEMPERATURE INPUT ADDRESS	
MEASUREMENT RANGE	
TRANSMISSION PROTOCOL	
SET POINT 1 RISE/FALL AND LEVEL	
SET POINT 2 RISE/FALL AND LEVEL	
SET POINT 3 RISE/FALL AND LEVEL	
SET POINT 4 RISE/FALL AND LEVEL	
SET POINT 5 RISE/FALL AND LEVEL	
SET POINT HYSTERESIS	
FASTLINK MARKER ADDRESS	
CONFIGURATION CHECKSUM	

**Table 4 SILBUS-TX1T Configuration record**

## 7 TERMINATIONS AND CONNECTIONS

All connections to the single channel temperature transmitter are via cage-clamp terminals around the perimeter and near the front of the DIN rail mounting enclosure, these terminals can accommodate up to 4mm<sup>2</sup> conductors. There are seven possible connections to the transmitter; these are shown in the following tables and diagrams:



**Figure 3 SILBUS-TX1T Connection diagrams**

## 7.1 TEMPERATURE INPUT PORT

The temperature input is provided with four terminals for the connection of the PT100 sensor. The SILBUS-TX1T temperature input will accept two, three or four wire PT100 sensors, the figures above show the connection of the sensor to the temperature transmitter. Terminal 12 is provided for connecting of earth to shunt away transients and noise. Use minimum 2.5mm<sup>2</sup> conductor for this connection.

TEMPERATURE INPUT TERMINATIONS			
INPUT	TERM #	LABEL	DESCRIPTION
CH1	8	DRIVE	200uA CURRENT DRIVE OUTPUT
	9	+SENSE	+VE SENSE INPUT
	10	-SENSE	-VE SENSE INPUT (Not implemented on SILBUS-TX1T)
	11	GND	GROUND RETURN
	12	EMC	EMC EARTH CONNECTION

**Table 5 Temperature input termination details**

The +SENSE terminal 9 is linked to the DRIVE terminal 8 for two wire PT100 sensors only. The –SENSE input is not implemented on the SILBUS-TX1T. Terminal 10 is only there to provide a place to terminate the –SENSE wire of a four wire sensor, no additional compensation is provided beyond that of a three wire sensor.

The temperature input is not galvanically isolated from the SILBUS network port; therefore it is important that the sensor and its wiring are completely isolated from earth or ground to avoid placing earths on the SILBUS network. The common mode noise rejection capabilities of the SILBUS network are significantly compromised if the SILBUS network is connected to earth or ground.



**Photograph 5 Typical 3 wire PT100 sensor**

## 7.2 SILBUS NETWORK PORT

The SILBUS network port provides a means for the transmitter to be connected to a SILBUS network. Any connections to a SILBUS field bus network pair should be of a multi-drop nature with spur lengths kept to a minimum. This will minimize any reflections and therefore communications errors in the SILBUS network.

SILBUS NETWORK PORT TERMINATIONS		
TERMINAL	DESIGNATION	DESCRIPTION
1	SIG	SILBUS NETWORK SIGNAL
2	COM	SILBUS NETWORK COMMON

**Table 6 SILBUS network port termination details**

The table above shows the SILBUS network port connections.

## 8 CERTIFICATION

The single channel temperature transmitter type SILBUS-TX1T has been awarded IECEx certification under IECEx TSA 07.0002X, Ex ia I, as part of the Dupline / SILBUS system.

The certification requires that the SILBUS-TX1T be mounted within a host enclosure that provides a minimum ingress protection of IP54 (IP55 for Queensland Australia).

The certificate should be consulted for any special conditions of use when designing the SILBUS-TX1T into an installation.

## 9 SOFTWARE REVISION AND DISPLAY

The software version of the four channel analogue transmitter type SILBUS-TX1T will vary as its functionality is improved at the request of our customers. The software version is given in two parts, the major revision level and the minor revision level and is written in the following format:

**VERSION M.mm** where M represents the major revision level and mm represents the minor revision level. E.g. VER 1.12

The software version can be determined by using the VER command on both console ports. Both ports should give the same firmware version. Refer to the SILBUS-SNM1 software release register (120-366-01) for a history of software / firmware updates.



## 10 SPECIFICATIONS

Name ..... Single Channel Temperature Transmitter

Type..... SILBUS-TX1T

Number of temperature channels ..... 1

Sensor type..... PT100 (2 wire, 3wire or 4wire)

Temperature range ..... -10°C to +100°C or -20°C to +200°C

Sensor drive current..... 200uA

Temperature input transmission protocol ..... FASTLINK or ANALINK

Resolution ANALINK..... Normal (0.43°C/LSB) or Wide (0.86°C/LSB)

Resolution FASTLINK..... Normal (0.03°C/LSB) or Wide (0.05°C/LSB)

Inaccuracy ..... ≤ 0.5°C Normal, ≤ 1.0°C Wide

Temperature Drift..... ≤ 0.03°C (relative to ambient temperature)

Console port configuration ..... 19200 baud, 8 data, 1 stop, No parity

Terminations ..... Cage clamp 4mm<sup>2</sup> maximum

Size..... 45mm (W) x 75mm (H) x 110mm (D)

Mass ..... 135g

Fixing ..... TS35 DIN rail only

Ingress protection ..... IP20

Enclosure material ..... Polycarbonate (30%GV) UL 94 V-1

Enclosure colour ..... RAL 7032 Grey

Terminal material ..... Polycarbonate UL 94 V-2

Terminal block colour..... Blue

Operating temperature range ..... 0°C to 40°C

Storage temperature range ..... -20°C to 80°C

Operating relative humidity range ..... 10% to 90% Non condensing

Power supply operating voltage range ..... SILBUS network line powered

Pollution Degree ..... 2

Installation Category ..... 1

Altitude..... 2000m

Humidity ..... 80% to temperatures up to 31°C  
..... decreasing linearly to 50%rH at 40°C.





.....max 80% rH, non-condensing