Title

HUBBUS

TWO DIGITAL INPUT TRANSMITTER

TYPE HBTX2D

USER MANUAL

Document Number

125-252-12

Issue

01

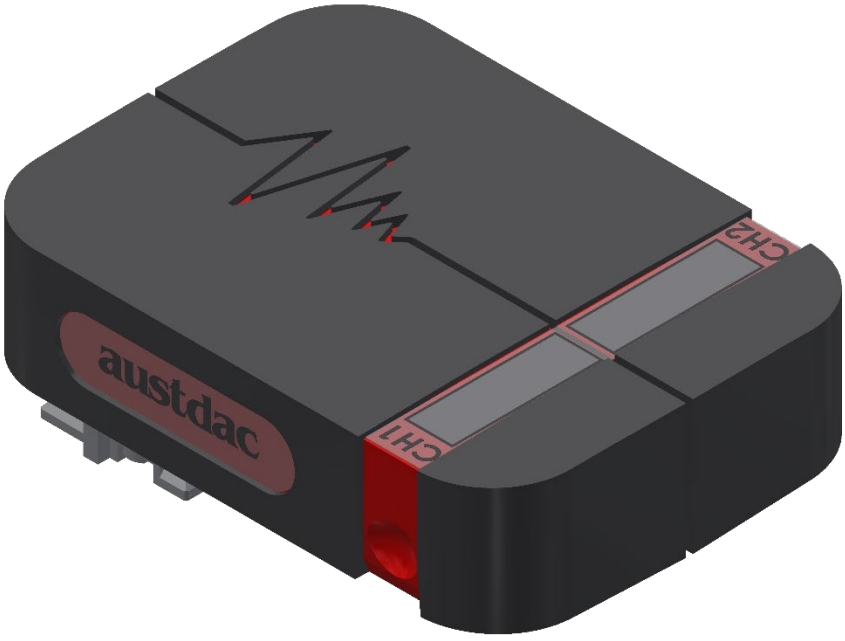

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TABLE OF CONTENTS

TABLES

FIGURES

1 Introduction

1.1 BACKGROUND AND CONTEXT

HubBus is Austdac's long distance distributed I/O system used in a wide range of applications in non-hazardous environments. HubBus overcomes the limitations of other distributed I/O systems in terms of noise immunity from new variable frequency drives, number of channels for input and output devices, transmission distances on large overland conveyors and powering devices from the communications line.

1.2 PURPOSE

This document is the user's manual for the HubBus two channel digital transmitter (HBTX2D). It provides an overview and a detailed description of the installation, use and operation of the HubBus two channel digital transmitter.

This document does not contain detailed information concerning the operation of the HubBus system. Refer to the "HubBus System Description and Overview" user's manual (125-250-12) for detailed information on HubBus. Likewise, refer to the HubBus Safety Manual (125-267-12) for any functional safety related specifications.

2 Warnings and Precautions

2.1 WARNINGS

WARNING: The HubBus Signal -ve line must not be tied to any common, 0V, ground or Earth points.

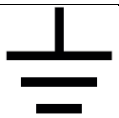
WARNING: The input ports on the HBTX2D are not galvanically isolated from the HubBus network. Measures are to be taken to prevent the inputs from shorting to metal structures, which may form an alternate return path for the HubBus signal line.

WARNING: If the HBTX2D is used in a manner not specified by Austdac then the protection provided by the HBTX2D may be impaired.

WARNING: This product may contain chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

2.2 SYMBOLS

Markings that may be used across the HubBus range of products to indicate precautions that must be taken to maintain safe operation of the system.

	Direct Current (DC) Supply
	Earth (ground) Terminal
	Caution, possibility of electric shock
	Caution (refer to user manual)

2.3 PRECAUTIONS

- Only qualified personnel shall install and service the HBTX2D.
- Mains supply fluctuations are not to exceed ±10% of the nominal supply voltage.

2.3.1 USER ACCESS

There are no user serviceable parts within the HBTX2D. The user should not open or disassemble the HBTX2D.

2.3.2 STORAGE, INSTALLATION, USE AND MAINTAINANCE REQUIREMENTS

The HBTX2D 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.

2.3.2.1 Storage

The specified storage temperature must be maintained during storage.

2.3.2.2 Installation and conditions of use

Prior to installation the HBTX2D should be inspected for the following;

- Any external damage to the enclosure.

The HBTX2D may be installed in any orientation.

The HBTX2D 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 HBTX2D should be mounted to a stable surface avoiding areas under constant vibration and shock.

3 Overview

3.1 GENERAL DESCRIPTION

The HubBus two channel digital transmitter is part of a family of products that form an Austdac HubBus distributed I/O system. The HBTX2D is a line-powered device that can transmit the status of up to two voltage free contact inputs over the HubBus network.

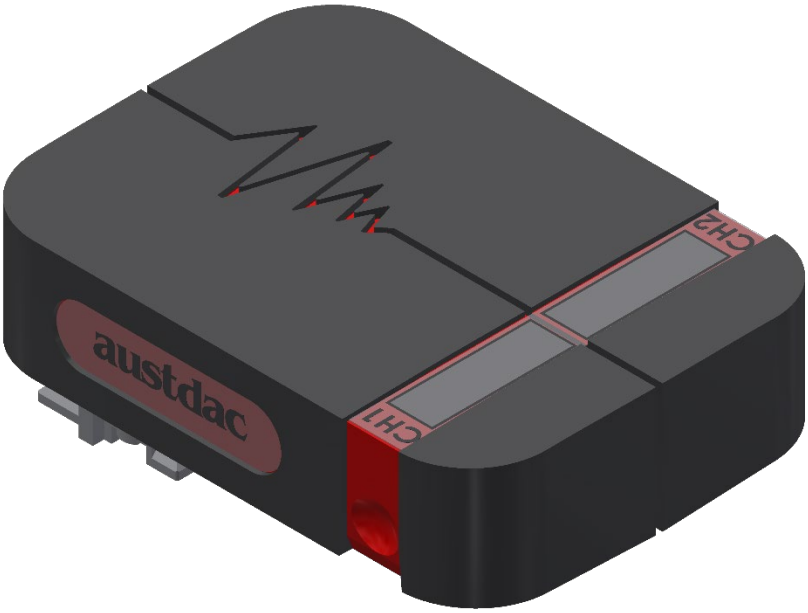


Figure 1: HubBus Two Channel Digital Transmitter (Top)

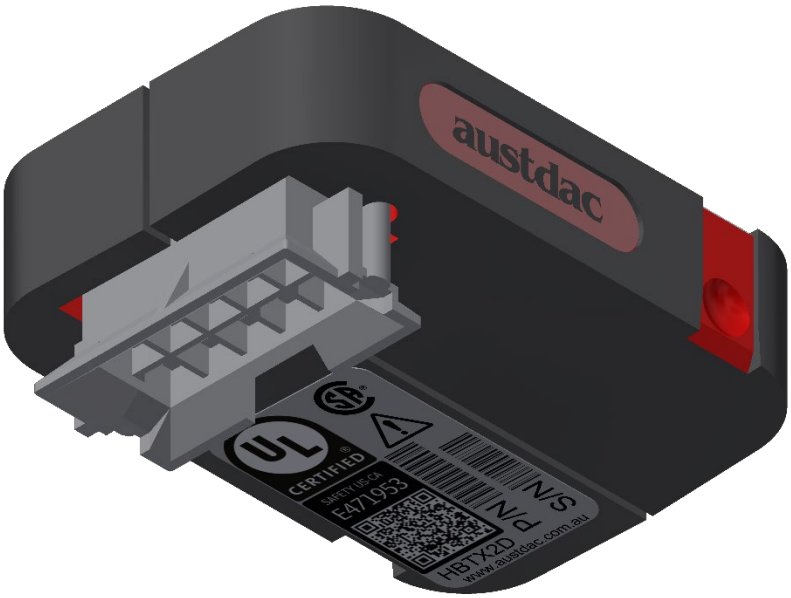


Figure 2: HubBus Two Channel Digital Transmitter (Bottom)

The HBTX2D can be configured using a laptop computer running HubBus configuration software and a small plug in programming adaptor or Austdac's HubBus Handheld programmer.

The two digital inputs can be programmed to transmit on any HubBus channel address. If both inputs are configured to transmit on the same channel then the transmitter behaves as a safety transmitter with one normally open and one normally closed input. The transmitter monitors the state of the inputs for fault conditions and transmits a fault status on the inputs programmed channel if a fault is detected.

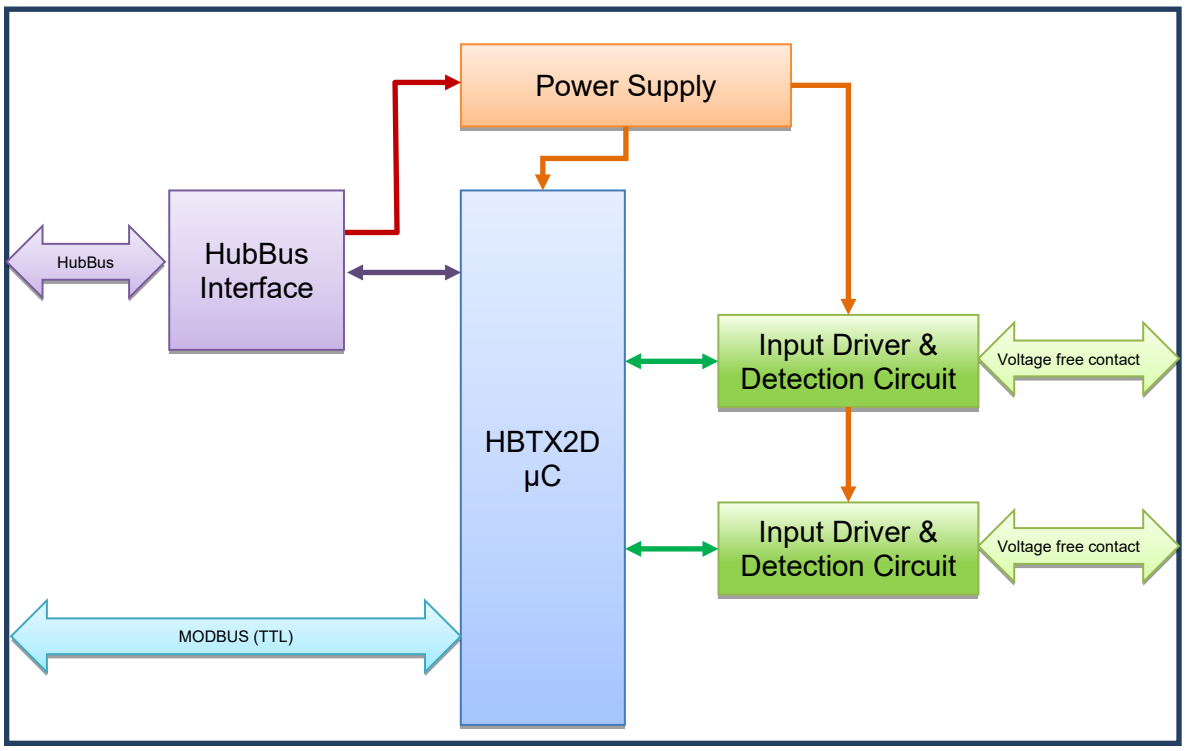


Figure 3: HubBus Two Channel Digital Transmitter Block Diagram

3.2 OPERATION

Each of the two channel digital transmitters' inputs takes the state (open or closed) of a voltage free contact input and transmits the state onto the connected HubBus network. The HBTX2D scans the state of the inputs every 50ms as well as checking for faults such as internal faults in the driver and detection circuitry and external shorts between the two contact inputs.

All configurable aspects of the two channel digital transmitter can be programmed via the configuration port. The transmitter will auto configure and operate with the number of channels and pulse bandwidth being transmitted by the channel generator.

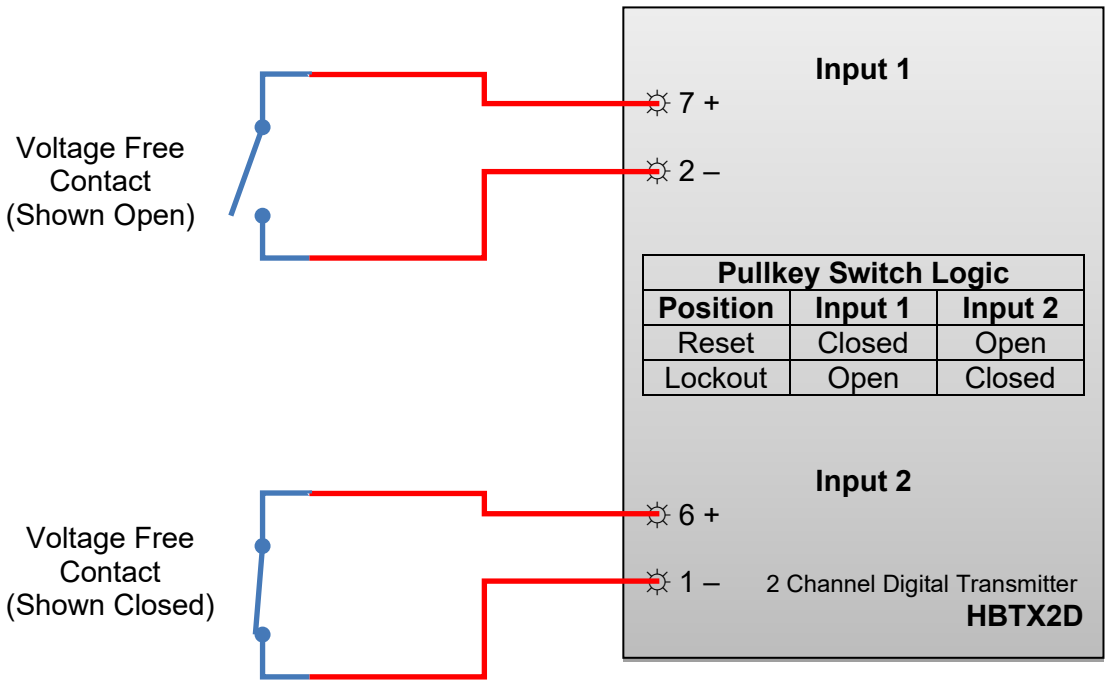


Figure 4: Input terminal wiring

4 Installation

4.1 ENCLOSURE

The HBTX2D should be mounted in a host enclosure providing protection against dust and moisture. A minimum ingress protection of IP54 is recommended.

4.2 MOUNTING

If mounting onto an Austdac pullkey or parking station plastic retainer clip should already be fitted to secure the transmitter.

If mounting to a panel, the HBTX2D retaining clip should be mounted to the panel to securely retain the transmitter and prevent inadvertent disconnection from the HubBus network and or input contacts.

If using a flying lead harness, a clip on the connect will retain the transmitter to the wiring harness. The transmitter should also ideally be secured inside the panel or housing.

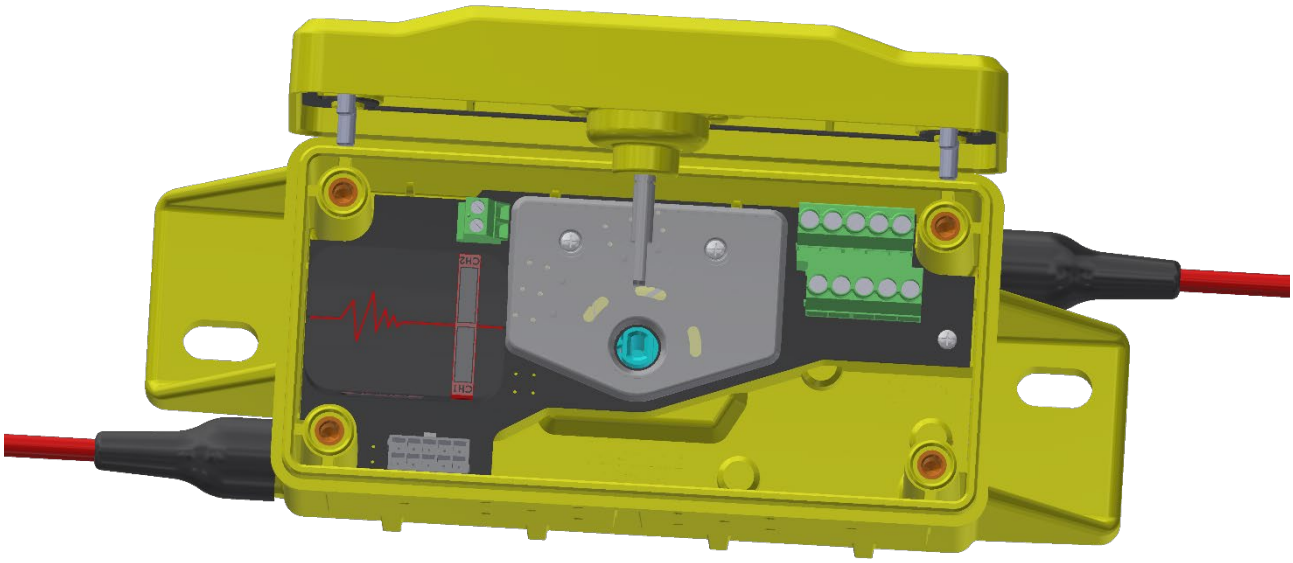


Figure 5: HBTX2D mounted in ESS3-4 Pullkey housing

4.3 WIRING

Ensure that any relay contact wiring is separated from the HubBus wiring by at least 50mm.

5 Transmitter Housing

5.1 OUTER

The transmitter enclosure is a custom made housing with an optional retainer clip which may be mechanically fixed to a PCB or panel.

As viewed from the top.

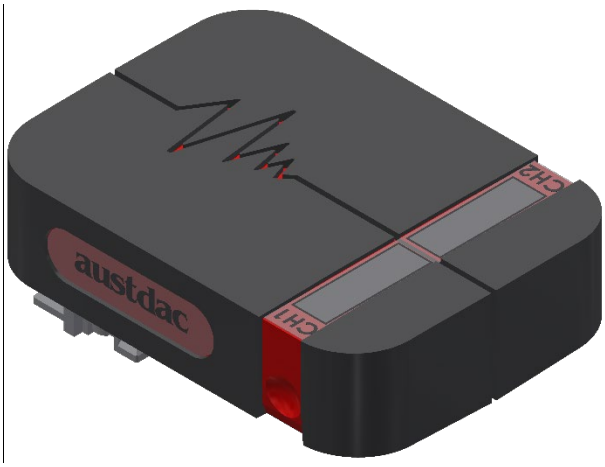


Figure 6: Transmitter top view

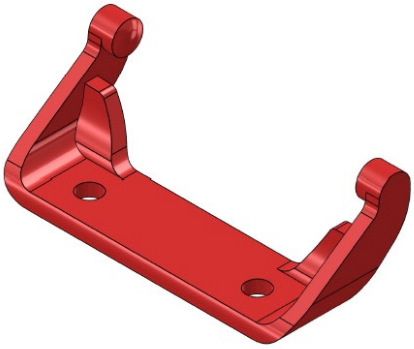


Figure 7: Retaining Clip

5.1.1 LEDS

There is only one LED indicator on the HBTX2D. The LED indicator gives a quick overview of the current device operational state.

5.1.1.1 Status

Colour	Flash Rate	Description
RED	Slow Flash	System functioning. Flashes once for the first configured HubBus transmission address. **NOTE:** Indicator not shown if channel generator configured to not show transmit status.
RED	1 Flash + Short Delay	Flashes quickly. Voltage supply fault
RED	2 Flashes + Short Delay	Flashes twice quickly, delay for 1 second and then repeats. Memory fault.
RED	3 Flashes + Short Delay	Flashes three times quickly, delay for 1 second and then repeats. Indicates a fault on input ports.
RED	4 Flashes + Short Delay	Flashes four times quickly, delay for 10 second and then repeats. Indicates HubBus signal acquired but invalid address configured so unable to transmit.

Table 1: STAT LED

6 Terminals

6.1 TYPE

The transmitter has a 10 way Molex Mini-Fit Blind Mating Interconnect (BMI). The BMI header allows for easy connections as the connector features flanges that help to "gather" or guide to the mating receptacle.

Along with the mating headers found on Austdac's pullkey and parking station PCBs other options are also available including;

- Panel Mount Receptacle, Molex Part Number 15-06-0101
- Flying-lead Receptacle, Molex Part Number 39-01-2105

6.2 LAYOUT

HBTX2D				
10	Signal+	HubBus	Signal-	5
9	+ve	12V / Spare		4
8	Rx	TTL Config	Tx	3
7	+	Input 1 (NO)	-	2
6	+	Input 2 (NC)	-	1

Table 2: HBTX2D Pinout

6.2.1 HubBus

HubBus terminals for interfacing to the HubBus network. The HubBus system is designed for transmitters to be online all of the time. This is unlike Austdac's SILBUS system where transmitters are switched on to the signal line when they are required to transmit.

The HubBus Signal -ve line must not be tied to any common, 0V, ground or Earth points.

6.2.2 Power/12V

Only used for configuring the unit if not connected to a live HubBus system. Only use Austdac approved cable and power supply.

6.2.3 TTL Config

This is a TTL (3.3V) MODBUS port at 19,200bps used for configuration. The HBTX2D is considered a slave device on the MODBUS network and therefore must be interrogated by a master device. Refer to the configuration section of this manual for instructions on setting network addresses etc.

6.2.4 Input 1 and Input 2

These are the two voltage free contact inputs. When operating as a two-channel digital transmitter the two inputs are independent and transmit on their own configured addresses. When operating as a safety transmitter the inputs are expected to be in opposite states to one another otherwise a fault condition is transmitted.

Type	Input Port		Transmit Channel	
	1	2	1	2
2 Channel	Open	Open	Open	Open
	Open	Closed	Open	Closed
	Closed	Open	Closed	Open
	Closed	Closed	Closed	Closed
Safety	Open	Open	Fault	N/A
	Open	Closed	Activated / Open	N/A
	Closed	Open	Reset / Closed	N/A
	Closed	Closed	Fault	N/A

Table 3: Input versus Transmit

7 Configuration and Parameters

The following are descriptions of system and device parameters. They are accessed via MODBUS parameters described in the following section.

The following are descriptions of the system and device parameters. They may only be configured using the Austdac Hand-Held Programmer type HHP1-H. Refer to the “HHP1-H Handheld Programmer User Manual” (125-198-12) for further information.

7.1 CONFIGURATION PROCESS

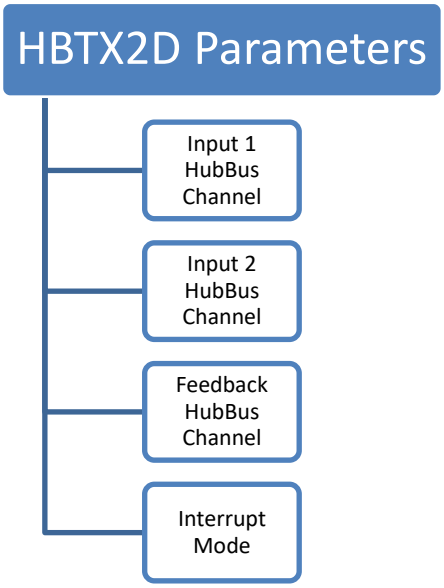
This unit may be used in a safety function. Only the Austdac Handheld programmer, type HHP1-H, may be used to configure the HubBus safety devices.

Configuration of safety devices follow the below process:

1. Enter the configuration option when the HHP1-H is connected to the device.
2. Scroll to the desired parameter to be modified.
3. The handheld will display the current value to the displayed parameter.
4. Press [ENTER] key to modify the parameter
5. Modify the parameter to the desired value.
    a. Press [MENU] to cancel and revert to the previous configured value.
    b. Press [ENTER] to accept the new value and send to device.
6. The value will be checked by the handheld and the device. If there are any problems an error message will be displayed on the handheld indicating the type of problem.
7. The new parameter value will be sent back to the handheld for visual confirmation by the user.
8. The user will be prompted to:
    a. Save the value by pressing the [ENTER] key, or
    b. Revert back to the original value by pressing the [MENU] key
9. The handheld will now display the parameter value as store in non-volatile memory in the device.

Note:	**Prior to disconnecting the handheld programmer, the user should verify all safety parameters are correct and document any changes made. Before restarting the system after making changes to safety parameters the safety functions must be validated.**

7.2 PARAMETER SUMMARY



7.2.1 Input 1/2 HubBus Channel

The HubBus channel over which the state of the voltage free input port will be transmitted over the HubBus network.

Limit	Parameter	Value (channels)
Minimum	0	Disabled
Maximum	2048	2048
Default	0	Disabled

Table 4: Parameter – HubBus Digital Input Transmission Address

7.2.1.1 Safety Transmitter

If both channels are configured to the same HubBus transmission address then the transmitter will behave as a safety transmitter where it expects the inputs to be in opposite (N.O. and N.C.) states.

7.2.1.2 Two input Transmitter

If the two channels are allocated different addresses the transmitter will behave as a standard two channel digital transmitter and the two inputs are treated independently.

7.2.2 Feedback HubBus Channel

The HubBus channel over which the feedback from the receiving device will be monitored. This channel serves as acknowledgement channel that the activeated state has been received by the intended module. When the safety input is triggered it will keep transmitting the activated state until outputs from the receiving device have been de-energised even if the input has been reset.

Limit	Parameter	Value (channels)
Minimum	0	Disabled
Maximum	2048	2048
Default	0	Disabled

Table 5: Parameter – HubBus Feedback Address

7.2.1 Interrupt Mode

If the emergency or auxiliary interrupt feature has been enabled by the channel generator this parameter determines which, if any of the interrupt modes will be used.

Value	Meaning
Auxiliary	Auxiliary Interrupt Enabled
Emergency	Emergency Interrupt Enabled
Disabled	No interrupt mode is enabled
Default	Disabled

Table 6: Parameter – Emergency Interrupt Mode

8 MODBUS

8.1 PHYSICAL LAYER

Mode: [Terminals] TTL (3.3V)

Protocol: Modbus RTU

Baud Rate: 19200

Data Bits: 8

Stop Bits: 1

Parity: Even

Address: 10

8.2 MODBUS REGISTERS

Register Limits:

- Code 1 / Read Coils: 128 bits
- Code 2 / Read Discrete Input: 128 bits
- Code 3 / Read Holding Registers: 32 words
- Code 4 / Read Input Registers: 32 words
- Code 15 / Write Multiple Coils: 128 bits
- Code 16 / Write Multiple Registers: 32 words

Modbus Address: 10

Message delay: 10ms

8.2.1 Device Identification

Type: Holding Registers

Register Name	Start Address	Number of registers	Read / Write	Description
Module Name	1024	4	R	"HBTX2D"
Module Identifier	1028	4	R	N/A, returns ""
Austdac Serial No.	1032	4	R	Austdac format serial number in the following format: "YYMMnnnn"
F/W Ver. Main	1036	1	R	Firmware version of the main microcontroller, most significant byte is the major and the least significant byte is the minor version number.
F/W CRC Main	1037	1	R	Returns 16-bit CRC signature of main firmware.
F/W Ver. Sub-ass.1	1038	1	R	N/A, returns 0.0
F/W CRC Sub-ass.1	1039	1	R	**N/A, returns 0**
F/W Ver. Sub-ass.2	1040	1	R	N/A, returns 0.0
F/W CRC Sub-ass.2	1041	1	R	N/A, returns 0
F/W Ver. Sub-ass.3	1042	1	R	N/A, returns 0.0
F/W CRC Sub-ass.3	1043	1	R	N/A, returns 0
Unique ID Main	1044	4	R	N/A, returns 0
Unique ID Sub-ass.1	1048	4	R	N/A, returns 0
Unique ID Sub-ass.2	1052	4	R	N/A, returns 0
Unique ID Sub-ass.3	1056	4	R	N/A, returns 0
Protocol Version	1060	1	R	HubBus MODBUS configuration protocol version.

8.2.2 Information

Not available on HBTX2D.

8.2.3 HubBus Digital

N/A

8.2.4 HubBus Datalink

N/A

9 Specifications

General	
Name	HubBus Two channel digital Transmitter
Type	HBTX2D
Interface	
Number of HubBus terminals	1
Bus channels	Adaptive (up to 2048)
Bus protocol	Dual pulse alternating on cycles
Bus connection	Non-Isolated
RS485	N/A
Configuration	TTL (3.3V), 19,2k/8/1/E
Physical	
Dimensions	W/O Clip: 40.5mm (W) x 55.3mm (L) x 21.6mm (H) W/ Clip: 46.8mm (W) x 55.3mm (L) x 21.6mm (H)
Mass	W/O Clip: 28g W/ Clip: 30g
Mounting	BMI Header with option clip
Ingress protection	IP20
Enclosure material	Transparent PC (Polycarbonate) V0 (UL94) Over-mould: TPU (Thermoplastic Polyurethane) V0 (UL94)
Enclosure colour	Transparent Red Over-mould: Black
Terminals	
Terminals	10 (2x5)
Terminal Pitch	4.20mm
Terminal Material	Nylon V0 (UL94)
Terminal Colour	Natural (White)
Environment	
Operating Temperature	-20ºC to 50ºC
Storage Temperature	-20ºC to 80ºC
Humidity	80% to temperatures up to 31ºC decreasing linearly to 50%rH at 40ºC max 80% rH, non-condensing
Pollution Degree	2
Installation Category	1
Altitude	2000m
Electrical	
Bus voltage	12-48VDC (p-p)
Unit load	1
Bus current consumption	1mA maximum @12-48VDC
Bus speed	Auto configurable (1.2ms to 4.8ms/pulse)
Power supply voltage	N/A
Power supply current	N/A
Status	
Transmitter Health	1 internal LED visible through housing
Digital Inputs	
Number of inputs	2
Type	Voltage free contacts
Open loop voltage	3.3VDC
Closed loop current	33µA
Minimum contact time	50ms
Maximum impedance	10kΩ

Table 7: Specifications