TDU
Touch Display Unit
FULL MANUAL

Introduction

The TDU features a 4.3” 480x272, 24-bit color, IPS panel with capacitive touch.

The IPS panel enables excellent viewability from any angle with high contrast, readable even in direct sunlight.

The TDU communicates using CAN and supports CAN 2.0A/B and CAN FD.

Made for 12V/24V applications.

The TDU can be panel mounted in a dash or used together with a RAM-B mount for a free-standing installation.

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TDU Overview

Technical data

- Input voltage range 8 - 32V_{DC} operational supply voltage
- Designed for panel mount or mounting with a RAM-B attachment. Held in place with four M4 screws
- Customizable cable length and connector with power/CAN bus

Mechanical data

- Operating ambient temperature -20° to +60°C
- Storage ambient temperature -30° to +80°C
- Dimensions, outline 128x88x20mm
- Sealed construction

Communication

- Customizable CAN protocol depending on customer needs
- CAN bit rate up to 5Mbit/s

Test standards

- Immunity conducted interference ISO 16750-2, starting profile, severity level 2
- Immunity conducted interference ISO 16750-2, load dump unclamped, +151V
- Immunity to interfering fields ISO 11452-2, 250MHz-1GHz, 100V/m
- Current injection ISO 11452-4, 1MHz-250Mhz, 70mA
- Interference emission CISPR 25, 30MHz – 1GHz
- ESD ISO 10605, 8kV contact, 15kV air
- Magnetic field immunity EN 61000-4-8, 50/60Hz, 30A/m

Table of content

1 About this document

1.1 Introduction

The instructions in this manual are to be used as a reference tool for the machine manufacturer's design, production, and service personnel to ensure a proper integration of the TDU module.

The user reading these instructions should have basic knowledge in working with electronic equipment.

1.2 Terms, definitions, and abbreviated terms

1.2.1 TDU

TDU refers to Touch Display unit. This is the product manual for the TDU.

2 Electrical characteristics

Parameter	Condition	Min.	Typ.	Max.	Unit
Operational voltage[1]		8		32	V_{DC}
Power consumption Idle[2]	32V < V_{IN} > 8V	1.5	2.5	3	W
Operating temperature[3]		-20		60	°C

Note: 1. Module fully operational.
2. Module fully operational. Backlight intensity 100%
3. The TDU is approximately 20°C warmer than the ambient temperature when operating with 100% backlight. When operating in ambient temperatures above 50°C, the backlight should be dimmed to keep the internal temperature of the TDU below 70°C.

3 Mechanical characteristics

Parameter	Condition	Min.	Typ.	Max.	Unit
Width			128		mm
Height			88		mm
Depth			20		mm
Weight[1]			155		gram

Note: 1. Measured without cable

4 Speaker data

Parameter	Condition	Min.	Typ.	Max.	Unit
Speaker frequency			2.73		kHz
Sound pressure level	Open air, 10cm distance		75		dBA

5 Absolute maximum ratings

Parameter	Condition	Min.	Typ.	Max.	Unit
VBB input voltage[1]		-150		150	V_{DC}
Input voltage CAN_L & CAN_H [1]		-36		36	V_{DC}
Storage temperature[1]		-30		80	°C

Note: 1. Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under recommended operating conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

6 Mechanical dimensions

Maximum protruding length of screws are 8mm.
All measurements are in millimetres.

7 Warranty

In the event of a malfunctioning TDU unit, the faulty TDU unit shall be sent to Electrum Automation AB for further investigation.
If the fault can be tracked to improper handling or usage, Electrum Automation AB reserves the right to claim the customer for costs involved in the warranty process.

8 Handling

8.1 Installation, commissioning, and maintenance

Installation, commissioning and maintenance of the TDU board shall be carried out by personnel with proper training. Personnel involved in installation, commissioning and maintenance shall be trained in such a manner that they do not contradict any of the requirements stated in this manual.
The TDU itself does not require any maintenance. Modification or repair of the TDU by third-party shall not be carried out and voids warranty.

8.1.1 Panel mounting

8.1.1.1 Surface flatness

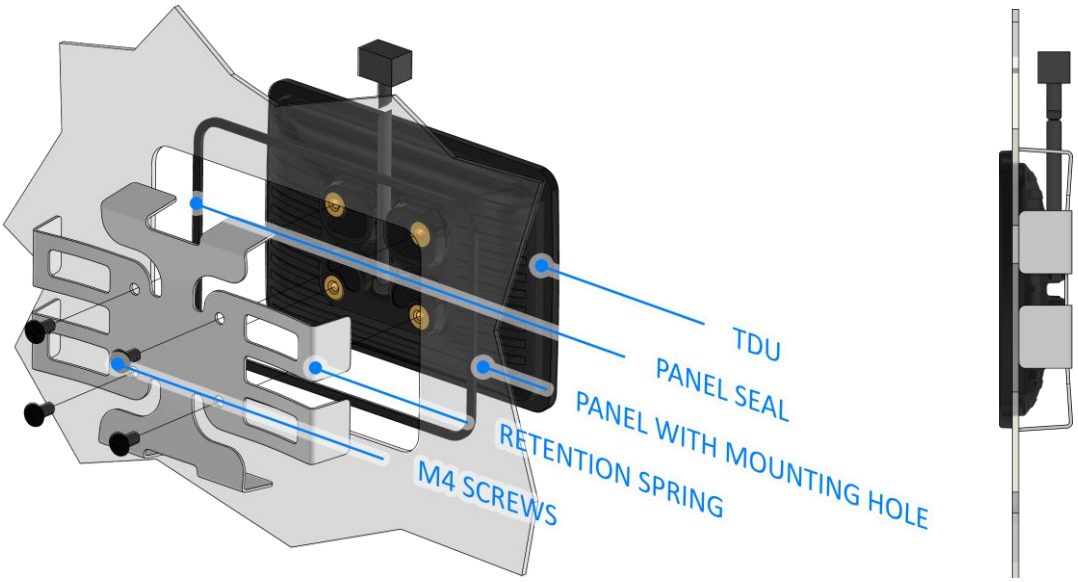
If the TDU is to be panel mounted, the TDU shall be mounted on a flat surface and must not be exposed to any torsional forces or mechanical stress.

Improper TDU mounting

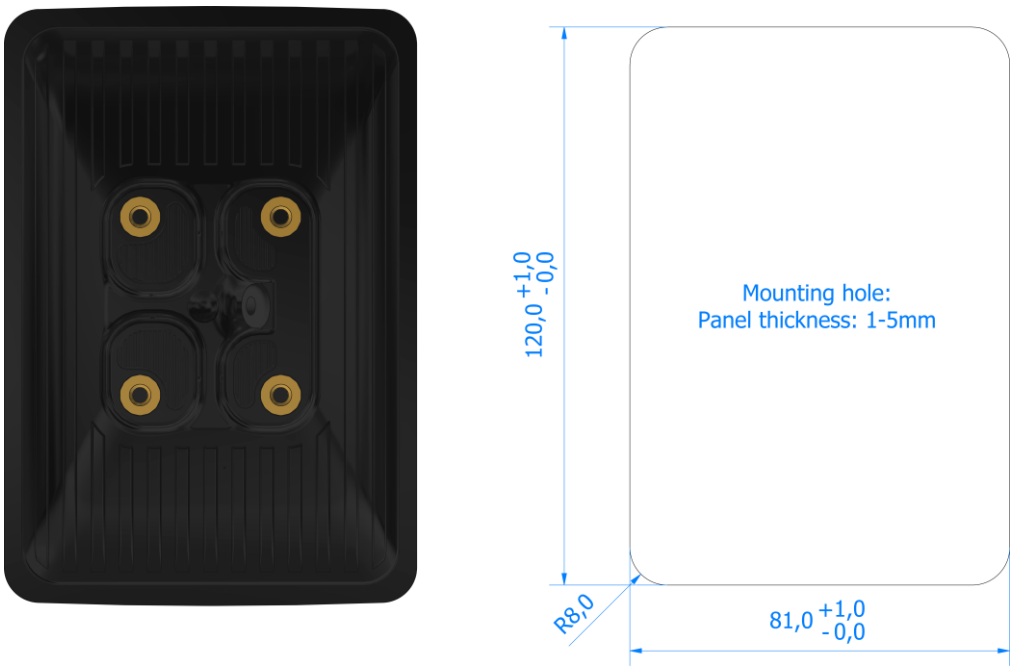
Proper TDU mounting

8.1.1.2 Panel mounting principle

The TDU can be mounted in a panel with the help of the TDU panel mounting kit. The TDU panel mounting kit consists of a panel seal, retention spring and mounting screws. The panel mounting kit is sold separately. See section 12.2 for more information.



The following figure stipulates the required mounting hole size in order to ensure a proper fit with the TDU module.



8.1.1 RAM® mounting option

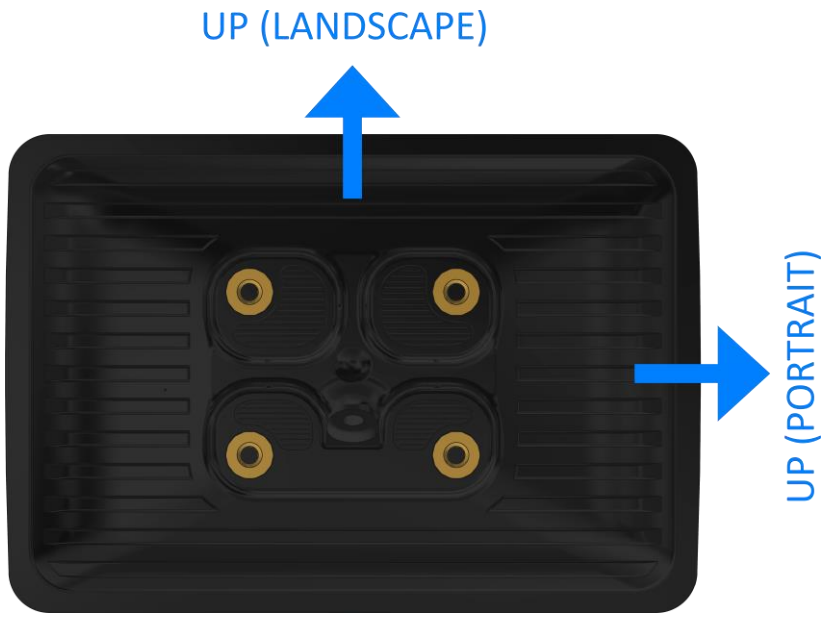
The TDU supports the AMPS hole pattern (30x38mm) which makes it possible to install any adapter supporting the AMPS hole pattern on the TDU.
Electrum recommends using a RAM® mount, the following figure illustrates the RAM-B-347U mount attached to the TDU.

8.1.1 Cable routing

The rear side of the TDU has tree cable track slots which enables the cable to be routed in three different ways to best suite the installation: left, right, or straight.

8.1.1 Landscape vs portrait

The TDU supports both landscape and portrait mode, the figure illustrates which side is considered up for the corresponding viewing modes.



8.1.2 Fuse protection

The supply voltage to the TDU shall be protected with a fuse with a maximum size of 1A. The fuse will protect the TDU module and wiring in case of device malfunction or overvoltage.

9 HMI Development

The key components of the TDU are:

- Microprocessor STM32H7
- 4.3” LCD IPS with capacitive touch
- 64MiB external flash memory

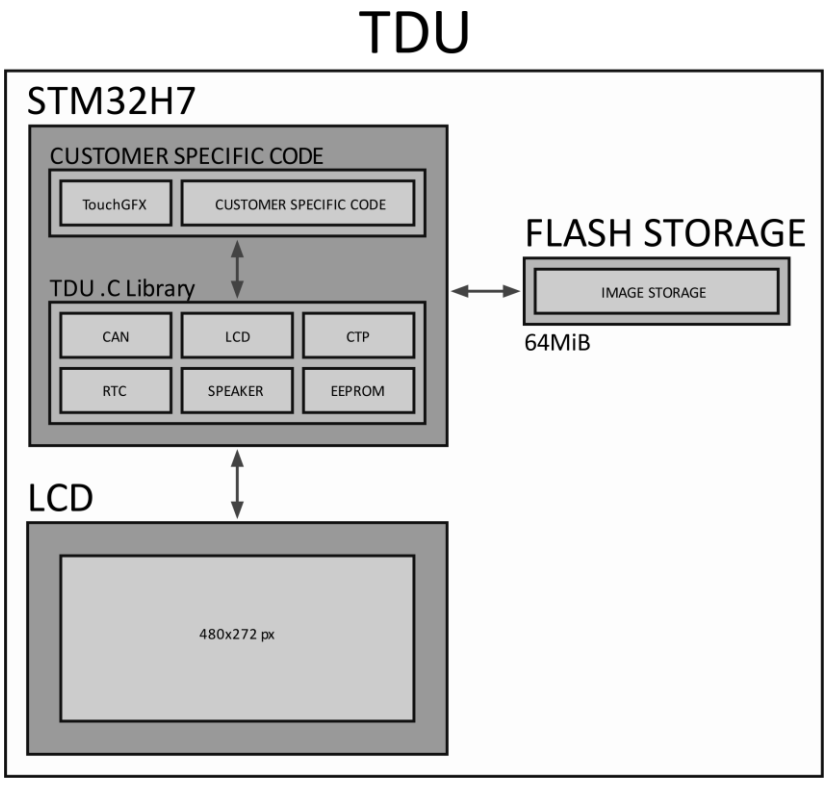
The flash memory is used to for storing static images. TouchGFX automatically places image resources in the external flash memory.

The firmware in the STM32H7 is divided in two sections:

- The customer specific code, generated in TouchGFX and STM32CubeIDE
- The TDU .C Library, a static .C library which implements the low level drivers for CAN, LCD, capacitive touch, real time clock, speaker, EEPROM and miscellaneous hardware interactions.

Electrum provides the customer with the option to engage our services for the development of the complete HMI design/software solution or to undertake the development themselves.

For the customers who wishes to undertake the development themselves, Electrum enables this by supplying offering a TDU development kit, along with a consultation meeting where we walk the customer through how to setup the development environment.



9.1 Programming

9.1.1 CAN bus

The TDU features a built-in bootloader which enables the firmware to be updated over the CAN bus. This feature makes it possible to update the firmware in a non-intrusive way using simple tools (PC and Kvaser CAN-USB dongle).
Electrum provides a PC bootloader application which can be run on all PCs running Windows 7, Windows 10, and Windows 11.

Electrum bootloader is available for download here: https://electrumab.se/downloads

9.1.2 Serial Wire Debug (SWD)

While developing firmware for the TDU the SWD interface is the preferred way of programming the TDU, this interface is faster than the CAN bus since it is not limited to the low bitrate of the CAN bus. This interface also enables debug capabilities when troubleshooting is necessary.

The one drawback of the SWD interface is that it requires access to the TDU circuit board. Therefore, the SWD interface can only be used on a TDU dev kit module which has no plastic housing.

10 CAN bus

The TDU supports CAN 2.0A, CAN 2.0B and CAN FD. The CAN protocol is customized according to customer needs.

10.1 CAN Bit rate

The TDU supports a maximum bitrate of 1Mbit/s when running CAN 2.0A/B and a maximum of 5Mbit/s while running CAN FD.

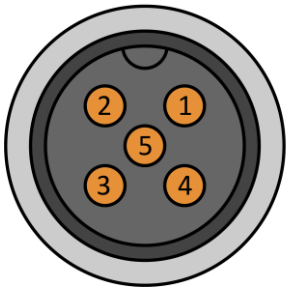
10.2 CAN termination

The TDU does not have a termination resistor, if a CAN termination is needed in closed proximity to the TDU module, it must be attached externally.

11 Connector

11.1 M12, 5P, A-code, Male

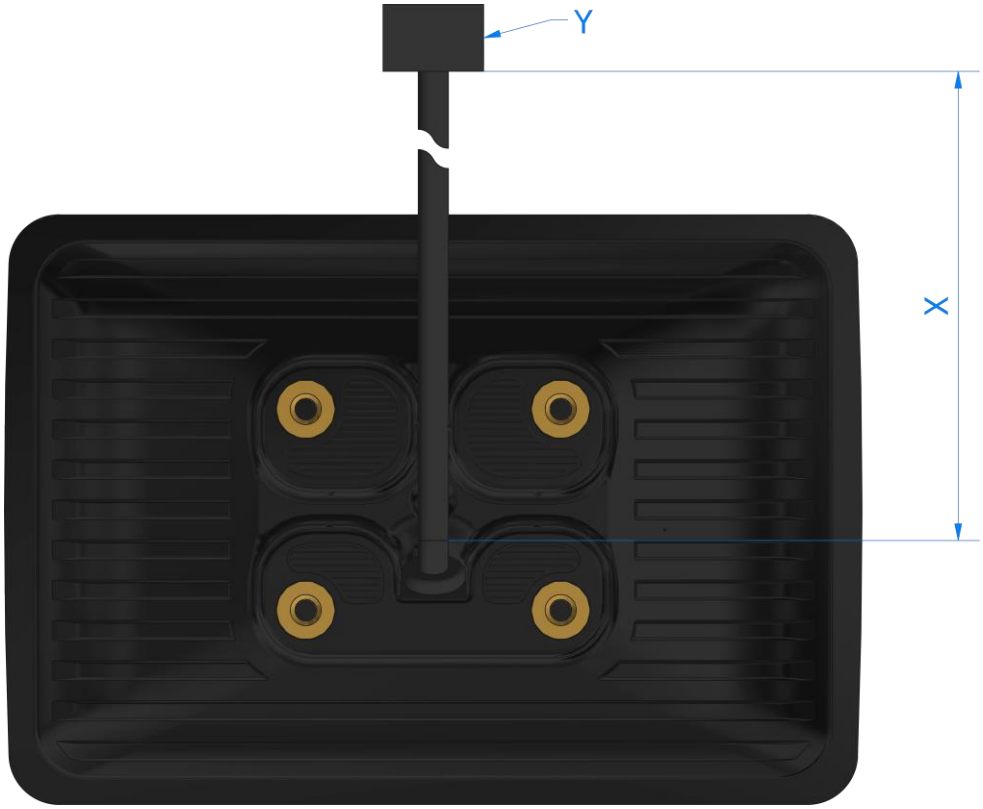
M12 5pin A-coded (Male)



Pin number	Pin identifier	Note
1	NC	Not connected
2	VBB	8-32V_{DC}
3	GND	Ground
4	CAN_H	CAN bus, high signal
5	CAN_L	CAN bus, low signal

12 Ordering information

12.1 TDU article numbers



Art.no[1,2]	Cable length (X)	Connector (Y)	Description
256875-A	0.3m	M12, 5P, A-code, Male	Standard TDU
256608-A	2m	M12, 5P, A-code, Male	Standard TDU
256876-A	2m	M12, 5P, A-code, Male	Special TDU for firmware development
256889-A	2m	M12, 5P, A-code, Male	Complete development kit: Special TDU (256876-A) SEGGER J-Link programming tool

Note: 1. Custom cable length/connector specification available on request
2. Customer specific firmware can be loaded before shipping on request, if requested a customer specific art.no will be generated.

12.2 TDU accessories article numbers

Art.no	Description
256838-A	TDU panel mounting kit including: gasket, retainer + 4x screws

13 Declaration of conformity CE

CE

Product name	**TDU**
Product description	Touch Display Unit
Manufacturer	**Electrum Automation AB**
Address	Industrivägen 8, 901 30 Umeå, Sweden

The undersigned hereby declares on behalf of Electrum Automation AB, that the above reference product, to which this declaration relates, complies with the essential requirements of the following applicable **European Directives**, and carries the CE marking accordingly:

2011/65/EU	Restriction of the use of certain hazardous substances in electrical and electronic equipment

And conforms with the following **Product Standards**:

CISPR 25	RF Emissions
ISO 11452-2	RF Immunity
ISO 11452-4	Bulk Current Injection
ISO 16750-2	Starting profile, load dump
ISO 10605	ESD
EN 61000-4-8	Magnetic field immunity
EN 50581:2012	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Person authorized to compile the technical file:

Thomas Moström
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2023-03-30	Umeå, Sweden	Thomas Moström
Date	Location	Thomas Moström Design Manager Electronic Production Electrum Automation

14 Document history

Document revision	Description	Release date
A	• Initial release	2023-04-03
B	• Added ordering number for panel mounting kit • Populated product weight • Populated power consumption • Added more information regarding panel mounting	2023-08-17
C	• Fixed wrong cable orientation in images	2023-09-21
D	• Added development kit to ordering information	2023-11-22

15 Contact us

For further information visit www.electrumab.se or contact us at info@electrumab.se.