INTRODUCTION

The T-Box™ 2 is a highly accurate torque measuring instrument with an intuitive 10.1” colour touch screen interface. Both hand and powered torque tools can be measured, calibrated or viewed in graph mode. The T-Box™ 2 has common torque units and large measurement memory for storage of test results.

T-Box™ 2 Part numbers covered by this manual

<table>
<thead>
<tr>
<th>Parts Included</th>
<th>Part Number</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-Box™ 2 Instrument with TDMS Software</td>
<td>43542</td>
<td>1</td>
</tr>
<tr>
<td>Power supply adapter</td>
<td>39979</td>
<td>1</td>
</tr>
<tr>
<td>USB Flash drive (Operator’s Manual / Software)</td>
<td>61908</td>
<td>1</td>
</tr>
<tr>
<td>Quick Reference Guide</td>
<td>34475</td>
<td>1</td>
</tr>
<tr>
<td>Hex Key (for stand)</td>
<td>24933</td>
<td>1</td>
</tr>
<tr>
<td>T-Box™ 2 Carry Case</td>
<td>266160</td>
<td>1</td>
</tr>
<tr>
<td>DC Extension Cable, 1.5 M</td>
<td>39998</td>
<td>1</td>
</tr>
<tr>
<td>Serial Null Modem Lead 2 M</td>
<td>39264</td>
<td>1</td>
</tr>
</tbody>
</table>

Accessories Available

<table>
<thead>
<tr>
<th>Parts Included</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-Box™ 2 to 10 way lead, for Norbar Rotary Transducers.</td>
<td>60216.200</td>
</tr>
<tr>
<td>T-Box™ 2 to 6 way lead, for Norbar Static &amp; Annular Transducers.</td>
<td>60217.200</td>
</tr>
<tr>
<td>T-Box™ 2 to no connector (for non-Norbar transducers).</td>
<td>60223.200</td>
</tr>
<tr>
<td>Extensive range of torque transducers.</td>
<td>Contact Norbar</td>
</tr>
<tr>
<td>Serial Data Lead Kit.</td>
<td>60248</td>
</tr>
</tbody>
</table>

NOTE: The suffix after the lead part number indicates the length of the lead in cm, thus XXXXX.200 = 2 metres. If Transducer leads are required of a non-standard length, the new suffix must be added to the part number when ordering (to the nearest metre).
FEATURES AND FUNCTIONS

- 10.1” Colour multi-touch screen with clear icons for ease of use
- Highly accurate ±0.05% of reading accuracy (±0.1% when below 5% of transducer capacity)
- Includes 6 modes for torque tool measurement: Track, Click, Dial & Electronic, Stall, Screwdriver and Hydraulic
- Can export readings and graphs to CSV or JSON format allowing for 3rd party software integration
- 2 Simultaneous transducer inputs
- Automatically recognises any ‘SMART’ Norbar transducer
- 5-digit resolution for all Norbar transducers
- Continuous output of up to 100 readings per second via RS-232 or USB virtual serial devices
- Operational from external 12v battery or mains power supply adaptor
- Multiple Targets to indicate status of Torque & Angle results. The Targets status is shown as symbols and background colours on the display, as well as outputs on the ancillary’s connector and serial port
- Continuous Data logging of Torque or Torque & Angle results
- Selectable frequency response for each mode of operation
- Ancillaries connector for each transducer with analogue output & GO/NO GO control for external equipment
- Serial Port for data output to a PC
- 120 GB results memory
- 2 USB ports for data transfer. Can be used with a mouse and keyboard
- All Peak and 1st Peak modes can be configured for either Manual or Auto Reset
- 13 torque units
- Displays torque only, torque & angle
- Rear panel features 100 mm x 100 mm VESA mounting holes, allowing for easy wall mounting

BEFORE USE

Updates

For the latest version of the T-Box™ 2 software and the latest version of this manual please visit https://www.norbar.com/Downloads/Software-Download/T-Box-2

Preparation

NOTE: If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

WARNING: ALLOW THE T-BOX™ 2 TO EQUALISE TO THE AMBIENT TEMPERATURE/HUMIDITY BEFORE SWITCHING ON. WIPE OFF ANY MOISTURE BEFORE USE.
Assembly and Connections

Assembly of the T-Box™ 2 onto the Stand

M4 x 8mm SCREWS SUPPLIED IN BAG. TIGHTEN WITH 2.5mm HEX KEY SUPPLIED.
Front Panel Connectors

WARNING: TO TURN ON AND OFF THE T-BOX™ 2 USE EITHER THE POWER BUTTON ON THE FRONT PANEL OR THE POWER ICON IN THE T-BOX™ 2 SOFTWARE
Rear Panel Connectors

PORT 2 ADC (Transducer)
PORT 2 Ancillary
Power Connector

PORT 1 ADC
(Transducer)
PORT 1 Ancillary
RS232

OPERATION

Power up

To power up the T-Box™ 2, connect the DC Power connector to the back of the T-Box™ 2, and plug the other end into the mains supply. Wait a few seconds for the system to initialise; you may see the power button blink on and off during this time.

Finally press the power button on the front panel. The T-Box™ 2 will take about 20 seconds to completely power up. Once completely powered the display will show two Select Task screens. This gives you the ability to work with two transducers at a time or to have 2 different views of the same transducer. In terms of screens and operation they are both identical.

If you need to turn off your T-Box™ 2 tap the power icon in the bottom left corner and then select ‘Shut Down’

IMPORTANT: TO TURN ON AND OFF THE T-BOX™ 2 USE EITHER THE POWER BUTTON ON THE FRONT PANEL OR THE POWER ICON IN THE T-BOX™ 2 SOFTWARE

TIP: The touch screen allows you to easily navigate through the T-Box™ 2 screens. A quick tap on an icon will take you to that screen and for some screen’s sliding your finger up and down will scroll the items on the screen.

TIP: The Settings Icon is always in the top left corner and this will return you to the Select Task Screen

If you need to turn off your T-Box™ 2 tap the power icon in the bottom left corner and then select ‘Shut Down’
Select Task Screen

This is the “main menu” of the T-Box™ 2 user interface. The T-Box™ 2 UI is a multitasking interface, comprising two separate windows which can each be assigned a task (such as managing targets, capturing a graph, or measuring a transducer).

You are free to pick any task for any window, at any time. You may, for example, choose to keep a measurement task open alongside a target manager task, such that you can quickly change targets while taking measurements. Alternatively, you may wish to measure something to capture readings while graphing the output simultaneously in the other window. Or, you may wish to measure from both transducer inputs at once with a pair of measurement tasks open.

The Select Task Screen allows you to select one of the following tasks for each of the two task windows:

- **Measure**: Opens the ANB Selection Screen and then the Measure Screen
- **Readings**: Opens the Readings Screen
- **File Browser**: Opens the File Browser
- **Targets**: Opens the Target Screen
- **Graphing**: Opens the Graphing Screen
- **Settings**: Opens the Settings Screen
Select ANB Screen

The T-Box™ 2 contains two inbuilt ANB (analogue board) modules, allowing for simultaneous reading of two transducers.

The Select ANB menu is used to select one of the two ANB (transducer) ports for measurement and is opened when the user wishes to use the Measure Screen. Once selected you will be taken to the Measure Screen. The example below shows a torque transducer (500 N·m) connected to ANB port 1, and a force transducer (50 N) attached to ANB port 2.

If you wish to measure from both transducers simultaneously, use the second window to open a second Measure screen and select the other ANB for that screen.

To select a transducer just tap on it. If you remove or connect transducers, press Refresh to update the changes on the screen.
Measure Screen

The Measure Screen allows you to view live results and historic results from the selected ANB port as well as providing access to all the settings needed to set up and take a measurement. For most users this will be the most interesting and often used screen.

The image below shows all the key areas of the Measurement Screen

See Example 1 (Page 30) - Click Wrench Torque Measurement

Mode Selection
- Shows the current mode. Tap to open the Mode Selection Screen (see Mode Selection Screen)

Current Target
- Shows the current target. Tap to open the Target Select Screen (see Targets Select Screen)

Reading Counter
- The total quantity of captured readings. If using a target with a defined number of readings, it will show X of Y readings captured against the target.

Reset Reading Counter
- If using a target with specified reading count, resets the X of Y reading counter

Reset
- Resets the current reading (if in manual reset mode). If in auto reset, this is disabled and just reads “auto”

Zero Transducer
- Zeros the Transducer

Save
- Saves the reading (if in Track mode or in manual reset and a reading has been captured). If auto-reset is enabled, it toggles auto-save instead.
Current Transducer  Shows the currently attached TD. Tap this to re-read the Transducer when changed. If changed, any current target will be cleared.

Current Units  Shows the current units. Tap to open the Units Selection Screen (see Units Selection Screen)

Readings  A brief summary of all readings captured with this AnB port this session. Tap Manage Readings to see a full-window breakdown and to save readings to disk.

Delete Readings  Deletes the selected reading (if selected) or the last reading taken if not.

Delete All  Deletes all readings for the current ANB port.

Sorting  By tapping Time, Result, or Dir you can sort your results

TIP:  To select a Result tap on it (Highlighted items have a white background)
To un-select an item tap on it again

TIP:  Keep the Targets screen and Measure screen open side-by-side to easily manage capture of data against multiple targets. Tapping “Set Target” will automatically set the target of the adjacent measurement window.
Mode Selection Screen

Mode Selection can be accessed via the Measure Screen and allows you to configure an ANB port for different types of measurement. It is important to select the correct mode for the type of tool you are testing. The filter frequency can be used for removing high frequency pulses on Pulse Tools. Once you have selected the correct mode and filter frequency, tap Set.

**TIP:** You will need to scroll this screen to see all the settings

- **Track**: Selects Track Mode (best for slow-changing, continuous torque signals)
- **Click**: Selects Click Mode (best for calibrating setting torque tools that click on target)
- **Dial**: Selects Dial Mode (best for calibrating indicating tools)
- **Stall**: Selects Stall Mode
- **Screwdriver**: Selects Screwdriver Mode
- **Hydraulic**: Selects Hydraulic Mode
- **Auto Reset**: When enabled this will reset the reading after a set time
- **Auto Reset Mode**: If Auto Reset is enabled this is the value of the Hold Time
- **Peak/First Peak Sensitivity**: This determines how sensitive the T-Box™ 2 is when detecting signal peaks in Click, Dial, Stall, Screwdriver & Hydraulic modes. If sensitivity is low, a larger drop after a peak is needed to register.
- **Active From**: Readings will start from N% above the capacity of the transducer

- **Noise Suppression**: Allows the user to disable noise suppression in order to capture and analyse extremely fast signals.

  *The data supplied in the T-Box™ 2 calibration certificate is obtained with noise suppression enabled. Disabling it may result in wider uncertainties due to noise.*

  The password to disable Noise Suppression is: transients

- **Filter Frequency**: Selects the ADC’s filter frequency
- **Set**: This will set the current measurement mode based on the settings above
TIP: Not all settings are available in all modes; some are mode specific.

TIP: If you want to capture graphs, bear in mind the ANB mode settings will affect the capture, so it is important to consider the mode before capture begins. If you need to check or change the mode, access Mode Selection from the Measurement Screen.

The mode effects on graphing are summarised below:

Track: Best for slow-moving signals and when maximum noise rejection is required.

Click: Best for graphing the behaviour of click-type setting tools such as ISO 6789:2017 Type II Class A tools.

Dial: Best for any other scenario than those outlined above. Probably, the most common all-purpose mode to use for graphing would be Dial mode.

Stall/Screwdriver/Hydraulic: There is no difference in graphing performance between these modes and Dial mode.

Units Selection Menu

The Units Selection menu is where you select the current measurement units for a Measure screen.

To access this screen, tap the units in the measurement dial (see Measure Screen section of the handbook, “Current Units” for a look at where to tap). Then pick a unit to switch to. If you change your mind and do not wish to switch, just pick the units you were using before.

If certain units have been disabled in the Settings >> Units Screen, then they will appear greyed out and cannot be selected.

TIP: If you set a target, the Measure screen will automatically switch to the correct units for that target.

TIP: The units available for selection will vary depending on the type of the currently attached TD (force, torque or pressure). The screenshot below shows Torque units.
Readings Screen

The Readings Screen is used to manage all readings from all AnBs attached to the system. You can also choose to focus on the readings from just one ANB port if you wish by filtering out other readings.

Each result has a time and date, the recorded values and units, and direction (which in the case of force or pressure, may be “positive” and “negative” instead of “CW”/“CCW”).

The result is colour coded depending on the Target limits used:

- **Green**: reading OK/pass
- **Yellow**: Reading too low (below limit)
- **Red**: Reading too high (above limit)

**NOTE:** If no target was set when the result was saved, then there is no colouration.

So, for a Target of 50 N·m +3% / -3% where the result is 50.67 N·m the result will be green (pass). If the result was too low (43.74 N·m) the colour will be yellow and too high (53.60 N·m) will be red.

The same colouration applies to angle and rate if the target contained limits for those measurements.

**TIP:** To select an item tap on it (Highlighted items have a white background)

To un-select an item tap on it again

This will allow filtering of the results by which AnB port took the reading

This will delete the selected reading (tap a reading to select; selection is highlighted in white)

This will delete all currently shown readings. If you have filtered the list, it will delete all readings shown based on current filtration settings (leaving the rest)

Readings can be sorted by time, direction or result by tapping the relevant table header
File Browser

The File Browser allows you to browse the filesystem and manage T-Box™ 2 data files such as Target files, Graphing captures & Readings data. Use the File Browser to copy, rename and delete these and any other files and folders.

TIP: The File Browser tries to remember what folder you were in the last time it was used. This can be useful when working with lots of similar files (such as editing many Target files).

TIP: To select an item tap on it (Highlighted items have a light red background)
To un-select an item tap on it again

TIP: To open a folder double tap on it
To open a file, double tap on it, or select it and then tap the Select button

TIP: You may need to scroll this screen to see the full list of folders/files

Drive Button
Breadcrumbs
Folder contents

Eject
This will allow you to safely eject a Memory Stick

New Folder
This will create a new folder in the currently open folder

Delete
This will delete the currently selected item

Rename
This will allow you to rename the currently selected item

Copy
This will copy the current selected item (can be a folder or a file)

Paste
This will paste the last item copied (can be a folder or a file)

Drive Button
This will allow you to select the main storage or Removable Media (USB memory)

Breadcrumbs
These indicate the currently open folder path; tap to jump back up the path

Folder Contents
This is the contents of the current folder as shown by the Breadcrumbs

Home
This will return you to the home folder of the currently selected drive
By default, the File Browser starts in the /home/user folder. This is the default directory (like the user folder on a Windows PC). You should see the Drive Icon looks like a hard disk, to indicate “internal memory” as the current data source. The breadcrumbs to the right of the Drive Button show the current location, like below:

![Breadcrumbs Home User](image)

The folder contents window will reflect the current contents of the /home/user folder, showing all files and folders.

If you navigate to the /home/user/Graphs folder (by double-tapping Graphs in the Folder Contents window) the folder will be opened, and the breadcrumbs will update to show the new location:

![Breadcrumbs Home User Graphs](image)

You can also use the breadcrumbs to navigate back up the path. Tap the “user” or “home” breadcrumbs to jump back to that location.

In addition to navigating and managing files, you can also use the File Browser to directly open Targets and Readings files (the File Browser window will switch to the appropriate task when you open the file).

**NOTE:** To open Readings files, they must have been saved in .tbrf JSON format.

CSV format files cannot be opened - to view CSV files on T-Box™ 2, install spreadsheet software like LibreOffice Calc or FreeOffice PlanMaker, or alternatively, use File Browser to copy the files to a memory stick and take them to a computer with spreadsheet software installed.

You can also use the File Browser to delete or copy files to and from a USB memory stick. This is useful if you want to share Targets with another T-Box™ 2, for instance, or send Graph data or readings to a PC.

Results, Targets and Graphs are stored in the following folders:
/home/user/Graphs
/home/user/Readings
/home/user/Targets

See Example 2 (Page 31) - How to copy Results Folder to Memory Stick

**TIP:** Two file browsers can be opened side by side to facilitate easy copying of files from one window to the other. This can be useful if you are working with lots of files at once, such as copying lots of individual Results files to a USB memory stick.
Targets Screen

The Targets Screen allows you to manage your targets. Targets specify test conditions and pass/fail parameters against which you can take measurements and store results. You can specify a target transducer reading, angle, and ISO 6789 rate timings against which to take measurements, as well as specify direction and number of readings.

For instance, a target might measure Torque Only in N·m in a Clockwise direction, specifying a pass value of 50 N·m and an allowable upper and lower range of +3% / -3%.

In older T-Box™ generations, the targets list was a singular, flat list of all the targets stored on the instrument. But in T-Box™ 2, you can have thousands of different target lists; each one comprising a separate .tbtf Targets file on the T-Box™ 2 internal storage. This allows for much better organisation of targets. For instance, you might choose to categorise targets by which type or capacity of tool they are for. You can use the Targets file capability and the File Browser to store, categorise and organise targets however you wish.

See Example 1 (Page 30) - Click Wrench Torque Measurement

TIP: You may need to scroll this screen to see the full list of Targets

TIP: To select an item tap on it (Highlighted items have a white background)
To un-select an item tap on it again

New/Edit Target
This will allow you to create a new Target. If a target is already selected in the Target List, it will allow you to edit the selected target

Duplicate Target
This will allow you to duplicate the selected Target

Delete
This will delete the selected Target

Set/Clear Target
This will set the currently selected Target as the measurement Target or clear the active target if no target is selected
When you first open the Targets Screen, it creates an empty Targets file in the following default location:

```
/home/user/Targets/single_targets.tbtf
```

This file will be shown at the top right corner of the Targets Screen. If you wish to use your T-Box™ 2 like an original T-Box™, then there is nothing else you need to do, just start adding new targets and they will be saved into the default list.

However, if you wish to create your own targets files and maintain separate, organised lists, then tap the Targets File button to create or select a different file. You will be taken to the File Browser to select a save location, or to select an existing file as appropriate.

**TIP:** If your work involves changing targets frequently, you may wish to keep the Targets Screen open alongside the Measurement Screen, so you can quickly change targets while taking measurements. When opened directly from the main menu or File Browser, the Targets Screen will set or clear targets on whichever ANB port is being actively used in the other window.

**Target Editor**

When making a new target, the editor is designed to guide you through the steps needed to set up your target.

When you first open the screen, most of the options will be hidden. First you will need to select a target type (force, pressure or torque) followed by the desired units and whether angle is required. After that the remaining options will unlock. If you are editing an existing target, all options will already be unlocked.

Shown below is the full editor layout; to access all options, use your finger to scroll up or down. Note that your screen will look a little different depending on your target type and whether angle is involved.

For example, if no angle is required then the angle target and angle trigger source fields will be hidden. Also, if you change the target type, all references to “Torque” will change to match, i.e. “Pressure Target” and “Stop Pressure”.

See Example 1 (Page 30) - Click Wrench Torque Measurement

**TIP:** You may need to scroll this screen to see the full list of settings

- **Select Unit**
  - This will set the units of measurement for this target. Available units will change depending on target type (Torque, Pressure or Force)

- **Torque Only**
  - This will set a Torque only target (no angle)

- **Torque Then Angle**
  - This will set a Torque then angle target

- **Name**
  - The name for this target in the target list

- **Direction**
  - You can select Clockwise Counter Clockwise or both directions for the target
<table>
<thead>
<tr>
<th>Qty of Readings</th>
<th>This is how many readings you want to take with this target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stop Torque</td>
<td>If you want the Ancillary port Stop Torque output to activate at a certain value, set Enable Stop and set the desired value</td>
</tr>
<tr>
<td>Torque Target</td>
<td>This is the target torque</td>
</tr>
<tr>
<td>Lower/Upper Limit</td>
<td>Set the allowable range for a “pass” on the target value</td>
</tr>
<tr>
<td>Rate Control</td>
<td>Specify an ISO 6789:2017 rate of application of torque. The Measurement Screen dial will guide you through the cycle to help meet the timings when the cycle begins</td>
</tr>
<tr>
<td>Direction</td>
<td>The direction of the angle measurement can be set to either Clockwise, Counter-Clockwise or Both</td>
</tr>
<tr>
<td>Angle Target</td>
<td>This is the Target value for the angle in degrees</td>
</tr>
<tr>
<td>Lower Deviation</td>
<td>This is the allowed deviation below the target angle in degrees</td>
</tr>
<tr>
<td>Upper Deviation</td>
<td>This is the allowed deviation above the target angle in degrees</td>
</tr>
<tr>
<td>Trigger</td>
<td>Internal trigger allows angle measurement to start when the Trigger Torque value is reached</td>
</tr>
<tr>
<td>Angle Trigger Torque</td>
<td>This sets the Trigger Torque value for Internal Trigger, at which point the angle measurement begins</td>
</tr>
</tbody>
</table>

**TIP:** The Save Target button will not activate until the target is valid to be saved. If it is not active, please check if you have missed any important fields.
Graphing Screen

The Graphing Screen allows you to capture graphs of transducer signals in a variety of sample rates from 1Hz to over 300Hz. When first opened it will start a live preview of transducer reading vs time for every ANB port that currently has a transducer attached. This means you may see one, two or no lines on the graph depending on what is connected to the ANB ports when the graphing feature is started.

**TIP:** To refresh attached transducers, use the Refresh button from the ANB selection screen, accessed from the Measure button on the “Select Task” main menu

The Graphing feature is very flexible. You can plot two different transducer inputs vs time, or one vs the other on the X and Y axes. You could plot a single transducer’s angle vs time and torque vs time in the same graph. You could plot angle vs angle across two transducers, and torque vs torque, in the same graph.

Despite this flexibility, it’s also quite easy to use. To set up a graph to suit your needs, just tap one of the XY axis pair buttons at the bottom of the screen. This will open the axis configurator, where you can choose the X and Y axis data source, displayed units, range, and the colour the axis is plotted on the display.

Captured graph data can be saved as a CSV file for import into spreadsheets, or as a .tbgf JSON-formatted data file for import into 3rd-party software. If you install spreadsheet software directly on the T-Box™ 2 you can review CSV files locally.

To see how graph data might be shared with a computer, see Example 2 (Page 31) – Copy Readings Folder to Memory Stick. Note that graph data is stored in the Graphs folder.

![Graphing Screen](image)

- **File Icon** 📚 Tap to change the drive/folder where the graph data is stored
- **Rec** Starts recording graph data
- **Clear** Clears any recorded graph data
- **Save** Save recorded graph data in JSON or CSV format
- **X1 Y1 / X2 Y2** Live axes state and values. Tap to set up an axis pair (set X & Y data source, units, range, sample rate & colour).
Axis Configurator

There are two X/Y axis pairs per graph, and by default, both will be activated if both ANB ports have a connected SMART transducer. Use the Axis Configurator to set up or disable an axis pair on a graph.

- **X/Y Port**: Choose the source ANB port from which to read data.
- **X/Y Type**: What type of data to plot (TD value, Angle, or Time).
- **X/Y Unit**: How to express the reading (locked to degrees for angle, and ms for time).
- **Show X/Y Scale**: Enable or disable the scale on that axis of the graph.
- **X/Y Min/Max**: Set the axis scale (auto scale, or custom value, or TD min/max value for TD axes).
- **Axis Colour**: Set the colour plotted on the graph.
- **Sample Rate**: Change the sample rate (default 30Hz).
- **Disable Axis**: Shuts down axis and removes the plot line from the graph.
- **Done**: Return to Graphing Screen.

**TIP:** If an axis data Type is set to “Time” it will be forced to the same source port as the other axis in the pair. This is because the graph can’t plot the time axis of one ANB port vs the value axis of another.

**TIP:** The maximum graph capture depth is over 1.17 million samples per axis. This is enough for continuous capture of between one hour and two weeks, depending on sample rate. Choose a sample rate appropriate to the speed of the measured signal and desired length of the graph.
Settings Screen

The Settings Screen allows you to configure and change various system settings.

Units
Opens the Units Screen

Serial Port
Opens the Serial Port Setup Screen

System Info
Opens the System Info Screen

Password
Opens the Password Screen
Units Screen
This screen allows you to select available units. Disabling a unit will mean it cannot be selected from the Target screen. This can be handy if for example all your measurements are in N·m

TIP: You will need to scroll this screen to see the full list of units

Serial Port
Here you can set up the configuration of the serial port Baud rate, Data bits, Stop bits, Parity and Flow control.

As well as the format of the data the output can be configured. It is important that the serial port configuration matched the configuration of the receiving device otherwise no data or corrupted data may be received.

TIP: You will need to scroll this screen to see the full list of settings

System Info
Here you can see details about your T-Box™ 2 system and perform firmware updates of the ANB hardware.

Software Update
The T-Box™2 has been designed to allow the end user to easily update the software; to do this you will need an internet connection, a memory stick and a keyboard.

First go to [https://www.norbar.com/Downloads/Software-Download/T-Box-2](https://www.norbar.com/Downloads/Software-Download/T-Box-2) download the latest software for the T-Box™2.

Update Main Application
1. If the T-Box™2 software is running tap the power icon and choose "Exit to Desktop"
2. Put that file on to a memory stick and put the memory stick into the T-Box™2.
3. When the file browser appears double click on the inbox_n.n.n.n.deb file
4. The Package Installer will pop up. Click Reinstall Package
5. Enter the password (NorbarTBOX) and press 'enter'
6. When the installation has finished, tap Close
7. Press the power button and tap Restart
8. The T-Box™ 2 will restart with the new version of software

After updating the Main Application, you may need to update the two analogue boards

Update Analogue Boards
1. From the Select Task screen tap Settings
2. Now tap System INFO
3. Tap the ADC you want to update
4. Select Update Firmware
5. Click 'I Understand' on the warning screen
6. Wait for Update to complete
7. If you get an Error at the end of the update Restart the T-Box™ 2
8. Check version Numbers of ADC boards
9. Repeat steps 3 - 7 for another ADC board
SPECIFICATION – GENERAL

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>Equivalent Torque</th>
<th>Accuracy</th>
<th>Calibration Uncertainty*</th>
</tr>
</thead>
<tbody>
<tr>
<td>@0.5 mV</td>
<td>5% of capacity</td>
<td>±0.1% of reading</td>
<td>±0.16%</td>
</tr>
<tr>
<td>@1.0 mV</td>
<td>10% of capacity</td>
<td>±0.05% of reading</td>
<td>±0.097%</td>
</tr>
<tr>
<td>@2.0 mV</td>
<td>20% of capacity</td>
<td>±0.05% of reading</td>
<td>±0.085%</td>
</tr>
<tr>
<td>@3.0 to 18.9 mV</td>
<td>30% to 110% of capacity</td>
<td>±0.05% of reading</td>
<td>±0.073%</td>
</tr>
</tbody>
</table>

*Using a coverage factor of k=2, to give a confidence level of approximately 95%.

Resolution: 5 active digits for all Norbar transducers.
Display: 10.1” Colour display with touch screen.
With update rate of twenty times per second (20Hz).
Torque Unit Conversions: To ‘BS 350:2004 Conversion factors for units’.
Zero Suppression: None
Time/Date Compliance: To year 2099
Units of Measurement: N·m, dN·m, cN·m, kgf·m, kgf·cm, gf·m, gf·cm, lbf·ft, ft·lb, lbf·in, in·lb, ozf·in, in·oz
Frequency Response: 8th Order Butterworth low pass filter with a –3dB point settable from 100 to 2500 Hz.
Angle Display: Channel A & B quadrature inputs give 4 unique logic states per pulse.
Angle display shown to 2 decimal places as examples:

<table>
<thead>
<tr>
<th>Transducer Pulses per Revolution</th>
<th>Transducer Pulses per Degree</th>
<th>Quadrature Logic States per Degree</th>
<th>T-Box™ 2 Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>360</td>
<td>1</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>720</td>
<td>2</td>
<td>0.125</td>
<td>0.13</td>
</tr>
<tr>
<td>1440</td>
<td>4</td>
<td>0.0625</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Operating Temperature Range: +5°C to +40°C.
Storage Temperature Range: -20°C to +70°C.
Maximum Operating Humidity: 85% Relative Humidity @30°C.
Power Supply Adapter: 100 to 240 V a.c. at 50 - 60 Hz input.
15V, 3.36A d.c. output (centre positive).
Power Consumption: < 20 w with no external USB devices connected
(External USB devices must not exceed 30 w)
Power Cable: 114 cm (44 ins) long.
Weight (T-Box™ 2 and Stand): 5.2 kg.
Dimensions: 254 mm high x 300 mm wide x 200 mm deep.
Case Materials / Finish: Anodised Aluminium and ABS.
Environment: Indoor use within a light industrial environment.
To environmental conditions Pollution Degree 2 & Installation Category (Over voltage Category) II.

NOTE: Due to continuous improvement all specifications are subject to change without prior notice.
SPECIFICATION – TRANSDUCER INTERFACE

Smart Transducers

Norbar ‘SMART’ transducers store the calibration data; they are available in 4 types:

<table>
<thead>
<tr>
<th>Suffix</th>
<th>‘SMART’ Transducer Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Integral Angle Encoder?</td>
</tr>
<tr>
<td>XXXXX.IND</td>
<td>No</td>
</tr>
<tr>
<td>XXXXX.INDA</td>
<td>Yes</td>
</tr>
<tr>
<td>XXXXX.LOG</td>
<td>No</td>
</tr>
<tr>
<td>XXXXX.LOGA</td>
<td>Yes</td>
</tr>
</tbody>
</table>

For additional accuracy SMART transducers can be factory programmed with a second-degree polynomial, so any slight errors can be reduced. These transducers are identified as ‘linearised’ on the transducer information screen.

Pin Connections

<table>
<thead>
<tr>
<th>Pin No</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+ve transducer excitation.</td>
</tr>
<tr>
<td>2</td>
<td>-ve transducer excitation.</td>
</tr>
<tr>
<td>3</td>
<td>+ve transducer signal.</td>
</tr>
<tr>
<td>4</td>
<td>-ve transducer signal.</td>
</tr>
<tr>
<td>5</td>
<td>Digital 0 volts.</td>
</tr>
<tr>
<td>6</td>
<td>Digital +5 volts for transducer selected, digital 0 volts when not selected.</td>
</tr>
<tr>
<td>7</td>
<td>Rotary transducer angle input (Channel A).</td>
</tr>
<tr>
<td>8</td>
<td>Rotary transducer angle input (Channel B).</td>
</tr>
<tr>
<td>9</td>
<td>Serial clock (SMART memory).</td>
</tr>
<tr>
<td>10</td>
<td>Serial data (SMART memory).</td>
</tr>
</tbody>
</table>

Connector Type

10 way ‘Push-Pull’ style panel socket
SPECIFICATION - ANCILLARIES

The Ancillaries connector contains inputs and outputs for connection to external equipment.

Pin Connections

<table>
<thead>
<tr>
<th>Pin No</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Digital +5 V (maximum current 5 mA)</td>
</tr>
<tr>
<td>2</td>
<td>External PRINT / RESET Input (Active High)</td>
</tr>
<tr>
<td>3</td>
<td>Low Limit Torque Output</td>
</tr>
<tr>
<td>4</td>
<td>Pass Limit Torque Output</td>
</tr>
<tr>
<td>5</td>
<td>High Limit Torque Output</td>
</tr>
<tr>
<td>6</td>
<td>Low Limit Angle Output</td>
</tr>
<tr>
<td>7</td>
<td>Pass Limit Angle Output</td>
</tr>
<tr>
<td>8</td>
<td>High Limit Angle Output</td>
</tr>
<tr>
<td>9</td>
<td>Digital 0 V</td>
</tr>
<tr>
<td>10</td>
<td>Tool Stop Output</td>
</tr>
<tr>
<td>11</td>
<td>Analogue Output</td>
</tr>
<tr>
<td>12</td>
<td>Analogue Output 2.5 V</td>
</tr>
<tr>
<td>13</td>
<td>Analogue Output 0 V reference (Do not connect to a noisy electrical ground)</td>
</tr>
<tr>
<td>14</td>
<td>External Snug Trigger Input</td>
</tr>
<tr>
<td>15</td>
<td>Not Used</td>
</tr>
</tbody>
</table>

External Print / Reset Input

Pins 1 & 2 are intended for use as an EXTERNAL PRINT / RESET:-

![Diagram of EXTERNAL PRINT / RESET connection]

The switch must remain active for at least 200 mS. Screened cable is recommended.

Limit Outputs

Pins 3, 4, 5, 6, 7 & 8 are buffered logic outputs intended for Go/No Go control of external equipment. The limit outputs are referenced to Pin 9 (Digital 0 V). All limit outputs are active HIGH and are updated every 10 mS.

The limit outputs change exactly with increasing torque, and at 0.5% of transducer capacity below the limit with decreasing torque. This eliminates the logic lines oscillating.

The Limit output current is, High = -0.8 mA, Low = 16 mA (not for direct control of relays).

Tool Stop Output

Tool Stop is used to provide a stop signal for an external pneumatic, hydraulic or electric tool. When the measured torque goes above the Tool Stop value (set in the Target Setup) this pin goes HIGH (5 V) with reference to pin 9.
Analogue Output

The analogue output is designed for connection to a control system. The DAC has an update time of 1 kHz. The calibration of the analogue output is factory set and not adjustable.

The analogue output is PIN 11.

If the output is measured against PIN 12 (2.5 V) the signal will swing positive for clockwise torque and negative for anticlockwise torque.

If the output is measured against PIN 13 (0 V) the signal will always be positive, with zero torque around 2.5 V.

TIP: Some transducers (Norbar Annular type) will give a negative output change for a positive torque. This is because they are designed to measure reaction torque.

External Snug Trigger Input

The external snug trigger is used to start the angle measurement; for external operation ensure the Target Setup has “Internal Snug Torque Trigger” UN-TICKED. Use logic 5 V (HIGH) input with reference to pin 9 (0 V).

Connector Type

15 way female ‘D’ type connector.
**SPECIFICATION - SERIAL PORT**

The serial port is for sending data to a PC.

See Settings Screen >> Serial Ports.

**Pin Connections**

The port is configured as DTE (Data Terminal Equipment) and conforms to RS-232-C specifications. The transmitted data voltage levels are between +5 to +9 volts and −5 to −9 volts.

<table>
<thead>
<tr>
<th>Pin No</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Not Connected</td>
</tr>
<tr>
<td>2</td>
<td>Received data (to T-Box™ 2)</td>
</tr>
<tr>
<td>3</td>
<td>Transmitted data (from T-Box™ 2)</td>
</tr>
<tr>
<td>4</td>
<td>Not Connected</td>
</tr>
<tr>
<td>5</td>
<td>Signal ground 0 V</td>
</tr>
<tr>
<td>6</td>
<td>Not Connected</td>
</tr>
<tr>
<td>7</td>
<td>Not Connected</td>
</tr>
<tr>
<td>8</td>
<td>CTS (clear to send)</td>
</tr>
<tr>
<td>9</td>
<td>Not Connected</td>
</tr>
</tbody>
</table>

**Data Output Example**

Code: DP=Decimal Point. CR=Carriage Return. LF=Line Feed. SP=Space.

T-Box™ 2 with the serial port set to the factory defaults. Reading 1068.4 lbf·ft (clockwise).

```
1 0 6 8 DP 4 SP l b f DP f t CR LF
```

**NOTE:** The maximum number of characters per line = 24.

**Connector Type**

9 way male ‘D’ type connector.

**Connecting Lead**

A 9 way female to 9 way female null modem connecting lead is required for connection to a PC with a 9 way male connector.

**SPECIFICATION - USB**

The T-Box™ 2 has two Universal Serial Bus (USB) connectors

These connectors can fully support the use of a Keyboard and mouse (not supplied)

**NOTE:** It is not advised to connect USB devices that may draw high current to the T-Box™ 2
MAINTENANCE

T-Box™ 2 Calibration

Your T-Box™ 2 has been supplied with a certificate of calibration. To maintain the specified accuracy, it is recommended that the T-Box™ 2 is recalibrated at least once per year. Re-calibration should be carried out at Norbar or by a Norbar approved agent, where all the facilities to ensure the instrument is functioning at maximum accuracy are available.

IMPORTANT: DO NOT REMOVE BACK PANEL OR CASE; THERE ARE NO CALIBRATION SETTINGS INSIDE.

Transducer Calibration

To maintain the specified accuracy, it is recommended that transducers are recalibrated at least once per year. Re-calibration and repair should be carried out at Norbar or by a Norbar approved agent.

Repair

Repair should be carried out at Norbar or by a Norbar approved agent, where all the facilities to ensure the instrument is functioning at maximum accuracy are available.

Do not remove the T-Box™ 2 case; there are no parts for operator repair inside.

Cleaning

Do not use abrasives or solvent based cleaners.

Product Disposal

This symbol on the product indicates that it must not be disposed of in the general waste.

Please dispose of according to your local recycling laws and regulations.

Contact your distributor or see the Norbar web site (www.norbar.com) for further recycling information.

Battery Disposal

This product contains 1 Battery. Only dispose of battery at end of product life. Batteries contain substances that can have a negative effect on the environment and human health.

The crossed-out wheeled bin means that batteries must NOT be disposed of in the general waste.

All batteries must be disposed of at a local waste battery collection point.

The battery does NOT contain mercury (Hg), cadmium (Cd) or lead (Pb). If the battery substances exceed the legal limits the battery would be marked with Pb, Cd or Hg.
TROUBLE SHOOTING

Tips are located within the operator’s manual to help with troubleshooting.

Common problems are listed below:

<table>
<thead>
<tr>
<th>Problem</th>
<th>Likely Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-Box™ 2 shuts down unexpectedly</td>
<td>Check there are no external USB devices connected that drew high current</td>
</tr>
<tr>
<td>T-Box™ 2 fails to start</td>
<td>Check power supply connections</td>
</tr>
<tr>
<td>T-Box™ 2 cannot find a transducer</td>
<td>Check that a Smart transducer is connected to one of the transducer ports</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Serial Port Problem</th>
<th>Likely Solutions</th>
</tr>
</thead>
</table>
| Serial data output is not communicating with other equipment. | 1. Check that the baud rate is set to the same as the receiving equipment.  
2. Check that all serial port parameters (Data bits, Stop bits, Parity & Flow Control) on the T-Box™ 2 and the receiving equipment match.  
3. Check the correct null modem serial lead is being used.  
4. Check if receiving equipment requires ‘First Character’ or limits removed or units removed. |
| Serial output is being overwritten. | Line feed required.  
In ‘Serial Port Setup’ change ‘Output Line Feed’ to ‘Enable’. |
| Cannot communicate with Norbar ‘Torque Wrench Calibration Software’ (Part No 37705.XXX). | The software will not accept limit characters LO / OK / HI.  
In ‘Serial Port Setup’ change ‘Output Limits’ to ‘Disable’. |
| Serial data too slow. | In the ‘Serial Port Setup’ change ‘Output Rate’ to a higher value |

NOTE: For more complex faults please contact Norbar distributor / manufacturer.
EXAMPLE SETUPS

Example 1 - Click Wrench Torque Measurement

For this example, we are going to check a Click Torque wrench set to 50 N·m with an accuracy of +3% / -3%

1. We will go through Transducer connection, T-Box™ 2 power up, mode selection, simple target creation, doing a measurement, and finally saving the result. Although this is a simple example it will give you a good understanding of the moving around the menu structure.

Connection and Power up

2. Connect correct Transducer to the T-Box™ 2
3. Connect the T-Box™ 2 to the power supply
4. Connect the power supply to the mains
5. On the T-Box™ 2’s front panel press the power button

Setting Up the T-Box™2

6. From the Select Task Screen tap MEASURE (you will see the Select ADC Screen)
7. Tap the Transducer icon to select the ADC port that the transducer is connected to (You will see the Measure Screen)

Setting the Measure Mode

8. Tap just below MODE (you will see the Select Mode Screen)
9. Tap CLICK then Scroll down. Under AUTO RESET tap Disabled
10. Press SET (You will see the Measure Screen)

Creating a New Target

11. Tap just below TARGET (you will see the Target Select Screen)
12. If New is available on the screen tap it (you will see the Targets New Screen)
   If New is not available tap on the currently selected target (this will de-select it) then tap New
13. Tap SELECT UNITS and Press N·m
14. Tap TORQUE ONLY (you should now see the Targets New Screen)
15. Tap just under TARGET IDENTITY and give your Target a name, then tap the Tick (you will be back to the Targets New Screen)
16. Under Direction tap CW
17. Tap # of Readings then enter 1 and tap the Tick (you should now see the Targets New Screen)
18. Under TORQUE TARGET tap Torque Target then enter 50 and tap the Tick
19. Tap Lower Limit, select Percentage and enter 3 tap the Tick
20. Do the same for Upper Limit
21. You should now be on the Targets New Screen having set up a 50 N·m Torque only target with +3% / -3% Limits and CW only.
22. When you have checked that, tap SAVE (You should now be on the Targets Select Screen)
23. On the Targets Select Screen tap your target (it should have a white background when selected) and tap SET TARGET

Doing a Measurement

24. You will now be back at the Measure Screen and you are almost ready to use your target
25. Check the Measure screen shows that MODE is CLICK MANUAL RESET and TARGET is 50 N·m +3% / -3%
26. Tap ZERO TRANSDUCER
27. The reading on the screen should be 0.00 N·m
28. You can now capture a reading
29. Once you have captured a reading you should see the result on the screen (colour will depend on the results red=too High, yellow=too low and green is a pass.
30. To Save the result tap the Save Icon
Example 2 – Copy Readings Folder to Memory Stick

In this example, we are going to copy your Readings Folder to a memory stick.

Finding your Readings Folder

1. From the Selection Screen tap File Browser
2. Tap the Drive Icon
3. Tap Main Storage
4. Tap home
5. Double tap ‘user’
6. Scroll to ‘Readings’
7. Single tap ‘Readings’

Copy Results

8. Tap Copy

Navigating to the Memory Stick

9. Tap the Drive Icon
10. Tap ‘Removable Media’
11. Double Tap the folder icon with the name of your memory stick

Pasting Results

12. Tap Paste
13. Wait for Files to copy
14. Press ‘Eject’
15. Remove Memory Stick from T-Box™ 2
# Glossary of Terms

<table>
<thead>
<tr>
<th>Word or Term</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.c.</td>
<td>Alternating current</td>
</tr>
<tr>
<td>Active From</td>
<td>Value from which the memory modes operate</td>
</tr>
<tr>
<td>Auto Reset Hold Time</td>
<td>The length of time a reading is displayed until automatically reset</td>
</tr>
<tr>
<td>CAL</td>
<td>Calibration</td>
</tr>
<tr>
<td>Capacity</td>
<td>Transducer full scale</td>
</tr>
<tr>
<td>Custom Calibration</td>
<td>A calibration that is not to ISO 6789</td>
</tr>
<tr>
<td>d.c.</td>
<td>Direct current</td>
</tr>
<tr>
<td>First Peak Sensitivity</td>
<td>The amount by which the reading must fall below the peak for the display to be held</td>
</tr>
<tr>
<td>Frequency Response</td>
<td>Frequency value below which signals are passed</td>
</tr>
<tr>
<td>Hz</td>
<td>Hertz, unit of frequency</td>
</tr>
<tr>
<td>ISO 6789</td>
<td>Hand torque tool ISO Standard</td>
</tr>
<tr>
<td>ISO 6789-1:2017</td>
<td>Part 1 of the latest version of the Hand torque tool ISO standard</td>
</tr>
<tr>
<td>ISO 6789-2:2017</td>
<td>Part 2 of the latest version of the Hand torque tool ISO standard</td>
</tr>
<tr>
<td>GB</td>
<td>Gigabyte – Amount of memory</td>
</tr>
<tr>
<td>Lemo</td>
<td>Reference for manufacturers of connector</td>
</tr>
<tr>
<td>mA</td>
<td>milli amp; One thousandth of an amp (0.001A)</td>
</tr>
<tr>
<td>MB</td>
<td>Megabyte – Amount of digital memory</td>
</tr>
<tr>
<td>mS</td>
<td>Millisecond; One thousandth of a second (0.001 second)</td>
</tr>
<tr>
<td>mV</td>
<td>Millivolt; One thousandth of a volt (0.001 volt)</td>
</tr>
<tr>
<td>mV/V</td>
<td>Millivolt per volt; Ratio of millivolt output to voltage input</td>
</tr>
<tr>
<td>NON-SMART</td>
<td>Standard mV/V transducer (NON-INTELLIGENT)</td>
</tr>
<tr>
<td>PC</td>
<td>Personal Computer</td>
</tr>
<tr>
<td>Pulse Count</td>
<td>The number of torque pulses applied in Pulse mode or Screwdriver mode</td>
</tr>
<tr>
<td>Sample Rate</td>
<td>Number of measurement samples taken in 1 second</td>
</tr>
<tr>
<td>SMART</td>
<td>Serial Memory Automatic Recognition Transducer (INTELLIGENT)</td>
</tr>
<tr>
<td>SMART Transducer</td>
<td>A transducer that holds its own calibration data (INTELLIGENT)</td>
</tr>
<tr>
<td>Snug Torque</td>
<td>Torque value to start measuring angle</td>
</tr>
<tr>
<td>Target</td>
<td>Torque or Angle value required. Each Target has an Upper Limit &amp; a Lower Limit</td>
</tr>
<tr>
<td>TDMS</td>
<td>Torque Data Management System – Software included for PC use</td>
</tr>
<tr>
<td>Tool</td>
<td>A reference to the tool being calibrated or used e.g. Torque wrenches, PneuTorques, Electric tools, Torque screwdrivers, etc</td>
</tr>
<tr>
<td>USB</td>
<td>Universal Serial Bus</td>
</tr>
<tr>
<td>V</td>
<td>Volts</td>
</tr>
<tr>
<td>Tap</td>
<td>A quick press with your finger on the screen</td>
</tr>
<tr>
<td>Double Tap</td>
<td>2 quick presses on the screen with your finger</td>
</tr>
<tr>
<td>Scroll</td>
<td>Press on the screen and move your finger up or down</td>
</tr>
<tr>
<td>TD</td>
<td>Transducer</td>
</tr>
<tr>
<td>ADC</td>
<td>Analogue Digital Converter</td>
</tr>
</tbody>
</table>