T600 Tag Tester

Operator and Maintenance Manual

DOCUMENT: UM 360420-835

REVISION: F

DATE: 28 Mar 2022

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NOTE: This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: IEC 60950-1 and/or EN60950-1, First Edition, Information Technology Equipment – Safety – Part 1: General Requirements require that this equipment must be located in a RESTRICTED ACCESS LOCATION (RAL). Only authorized personnel can have access to the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their expense.

Changes or modifications not expressly approved by Kapsch TrafficCom Canada Inc. could void FCC compliance and the authority to operate the equipment.

FACTORY SUPPORT SERVICE

For Return Material Authorization (RMA) numbers please telephone: 905 624-3020.
For service information and other requests please FAX: 905 625-6197.

NOTICE

The information presented in this document is current although it is subject to change. As such, **Kapsch TrafficCom Canada Inc.** assumes no liability on behalf of the USER with respect to interpretation based on the use of this information

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Document Revision Control

Version Date	Revision	Changes	Editor
28 Mar 2022	F	ECN 22021 address change for US office	B. Mac
15 Nov 2018	E	ECN: 18057: Updated procedure on Agency Mapping file upgrade. Updated launch instruction for Windows Vista and above.	S. Lee
5 Dec 2014	D	ECN: 14119: Updated installation instruction in section 5 for the support of Windows 7 /8 /8.1	S. Lee
7 June 2012	C	ECN 12063: Incorporated the following information added to section 5 provided by Sandra Lee, Software Engineer: Added changes to the "Installing T600 Software" procedure concerning the CD ROM Added the following procedures: - How to identify Interior OBU (G4E) from the older model FPT (G3B) - How to identify Exterior OBU (FME) from the older model LPT - Examples Added "Agency mapping file configuration for tag types" and the Table 5-1: Tag Type Descriptions Added Figure 8-6: High Occupancy Toll (HOT) OBU to the Appendix.	M. Kleiza
15-Aug-2011	B	ECN 11121: Since new document number employed, revision resets to 'B' Updated 8 Appendix – removed headings and illustrations of LPT modules; added direction arrows to both Front Mount OBUs	M. Kleiza

Version Date	Revision	Changes	Editor
		Updated Table of Contents Updated Acronyms and Synonyms Review comments incorporated	
04-Aug-2011	G	ECN 11121: Overall update of manual Added top-down view of correct orientation of all supported tags Updated company name	S. Garlick
24-Feb-2010 & 8-Sep-2010	F	Add cradles for new tag types. Changed calibration media information. Editing changes Minor grammar and minimal writing edits Laser operation - safety notes Hand-held scanner model is now LS2208 Identify hand-held scanner Power Supply Cable diagram for optional scanner	C. Santillan, E. Rolo, H. Pang P. Perri B. Middlemiss
26-Jan-2004	E	FPT G3 Identification	
5-Dec-2003	D	changed scanner initialization	
17-Nov-2003	C	add in keyboard wedge scanner	
9-Oct-2003	B	changed Appendix	
5-Sept-2003	A	preliminary release issue	

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1. ABOUT THIS MANUAL

This guide provides instructions on how to install and operate the T600 Tag Tester for testing Kapsch TrafficCom Canada Inc. On Board Units (OBUs), also referred to as tags.

Kapsch TrafficCom Canada Inc. supplies the T600 Tag Tester. This manual is divided into two parts; Operator Instructions and Maintenance Instructions. See the Table of Contents for more details.

This manual is the main reference document used during training given by Kapsch TrafficCom Canada Inc. to operator, installation and maintenance personnel. These personnel should be proficient in using the Windows operating system. Additionally, installation and maintenance personnel must be able to configure the customer-supplied computer serial ports. This manual is also used as a reference by Kapsch-certified technical service personnel in the field once training has been completed.

Note: The terms **OBU** and **tag** are used interchangeably in the manual.

Warnings and Cautions

Warnings

Warnings indicate a risk of bodily harm and include a symbol indicating the type of injury that is at risk.

> ⚠️ **WARNING:**
> WARNING DESCRIPTION HERE.
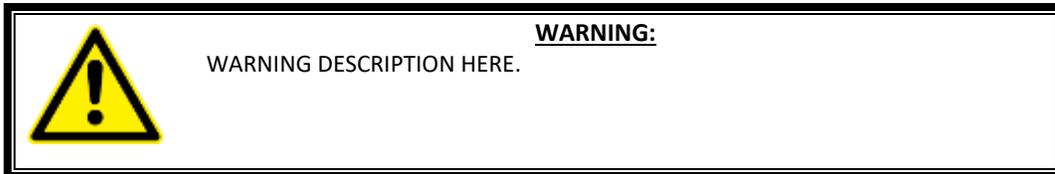
The following warnings appear in the manual:

DO NOT STARE DIRECTLY AT THE LASER BEAM OR ANY SECONDARY REFLECTIONS EMITTING FROM THE INTERNAL TTU BAR CODE SCANNER. LASER LIGHT CAN CAUSE EYE INJURY AFTER PROLONGED EXPOSURE. THE INTERNAL TTU BAR CODE SCANNER EMITS CLASS 2 LASER LIGHT.

DO NOT STARE DIRECTLY AT THE LASER BEAM EMITTING FROM THE HAND-HELD BAR CODE SCANNER. LASER LIGHT CAN CAUSE EYE INJURY AFTER PROLONGED EXPOSURE. THE HAND-HELD BAR CODE SCANNER IS A CLASS 2 LASER PRODUCT.

Cautions

Cautions indicate a risk of damage to equipment or loss of data.

	CAUTION:
	Caution description here.

The following caution appears in the manual:

Ensure the OBUs are placed correctly in the TTU cradle. Operational OBUs could fail if not orientated correctly in the cradle.

OPERATING INSTRUCTIONS

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2. OVERVIEW

Introduction

The T600 Tag Tester Unit (TTU) ensures OBUs are functioning properly by testing at what RF signal levels the OBU can reliably send and receive RF signals.

T600 system components

- a T600 Tag Tester Unit (TTU), with external power supply

- a serial null-modem cable

- a serial scanner cable

- a T600 software Installation CD

- Optional: Calibration files

- Optional: a Hand-held bar code scanner

Figure 2-1: T600 Tag Tester System Components

customer-supplied computer running Kapsch-supplied T600 software

optional hand-held bar code scanner

Tag Tester Unit (TTU)

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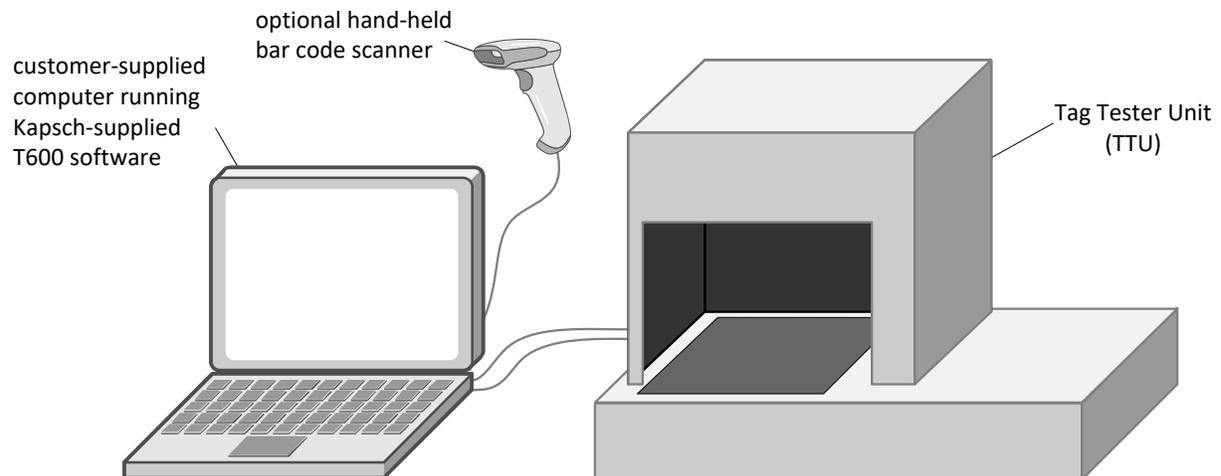
T600 Tag Tester Unit (TTU)

The T600 has two RF channels each set to different power levels required to support communication with various Kapsch TrafficCom Canada Inc. OBUs.

The T600 TTU antenna located under the tag cradle communicates with OBUs placed in the cradle during testing. A test can only be initiated after a proximity sensor located in the cradle detects the presence of an OBU. A bar code scanner located inside the T600 reads the serial number printed on the OBU label, while an optional external hand-held bar code scanner may be used for the same purpose.

TTU antenna

The antenna is located underneath the OBU cradle.

TTU OBU cradle

The cradle is shaped to ensure the various OBUs are positioned correctly in the TTU. OBUs must be correctly orientated in the cradle to achieve accurate test results (see '**Note**: Correct orientation of the G4 OBUs in the TTU cradle', page 50).

Figure 2-2: Tag Tester Unit (TTU) - Front View

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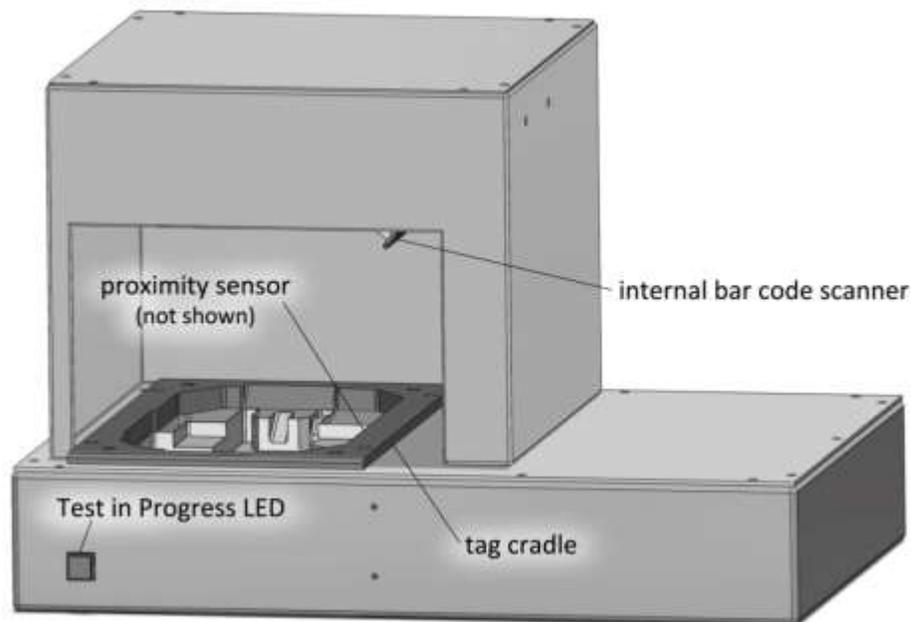
Figure 2-3: Tag Tester Unit (TTU) - Rear View
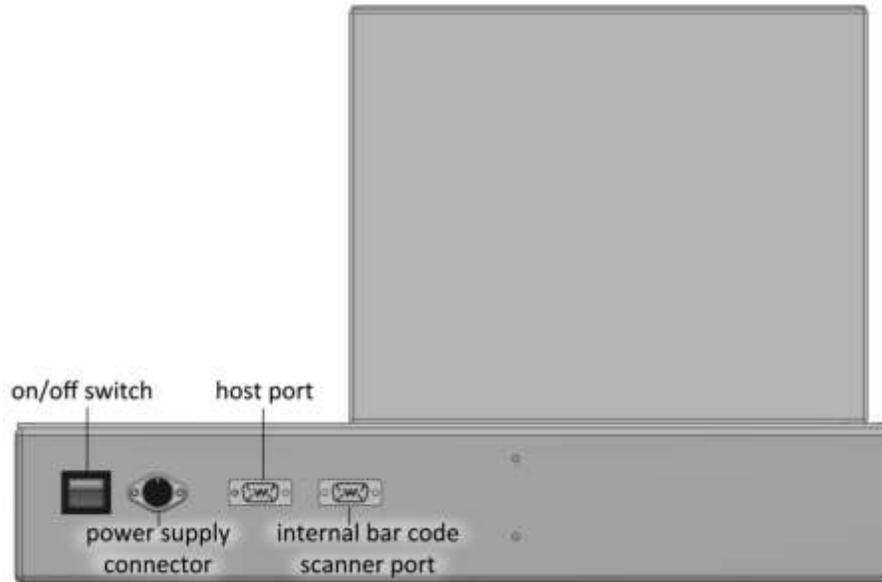
T600 software

A customer-supplied computer running the T600 software provides the user interface for the TTU via an RS-232 communications link.

The user interface shows the user interface nomenclature used throughout the manual and the location of the Tag Pass message.

Figure 2-5 shows the location of the tag failure messages.

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Figure 2-4: Tag Pass Message
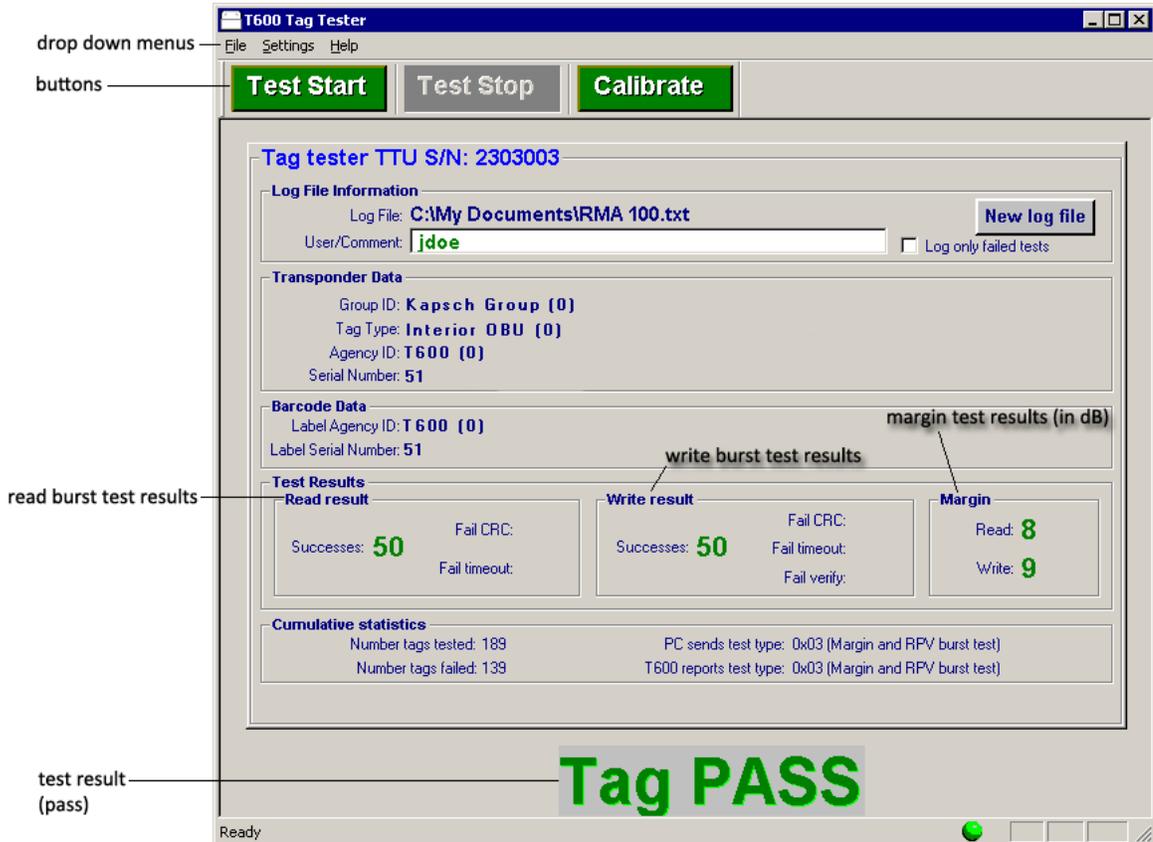
Figure 2-5: Tag Failure Message

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How the T600 Tag Tester works

The T600 tests OBUs by determining the RF signal strength required to successfully and consistently communicate with a given OBU.

The T600 begins the test by sending out an RF signal at the maximum attenuation level (15 dB). The T600 then waits for a response from the OBU. If the T600 does not receive a response from the OBU, the T600 decreased the attenuation by 1 dB (thereby increasing the signal strength) and repeats the process. The T600 continues this process until a successful read occurs or a response is not received from the OBU at the maximum signal level (0dB).

If the RF signal level required to communicate with an OBU is not within the acceptable limits, the OBU fails the test. Contact Kapsch TrafficCom Canada Inc. to arrange an RMA so the OBU can be returned.

The T600 scans the bar code on the OBU to confirm the OBU's identity. If the bar code data does not match the data in the OBU, the OBU fails the test.

The test results

For a tag to pass the test, the following conditions must be met.

- The Read margin is within tolerance.
- The Write margin is within tolerance.
- The Read results are within tolerance.
- The Write results are within tolerance.
- The barcode ID must match the transponder serial number.

Margin results

The Margin Read value is the dB level that results in consecutive reads of the OBU, whereas the Margin Write is the dB level that results in consecutive writes to the OBU. Any Read or Write value outside of the acceptable dB range results in a tag failure.

Correct tag data

The T600 also checks to confirm that the OBU contains the correct data (correct tag type, correct Agency ID, etc.). If this information is incorrect, the OBU fails.

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T600 Tag Tester communication functional blocks

Figure 2-6 illustrates the communication interfaces of the T600 Tag Tester system.

Figure 2-6: T600 Tag Tester Communication Block Diagram
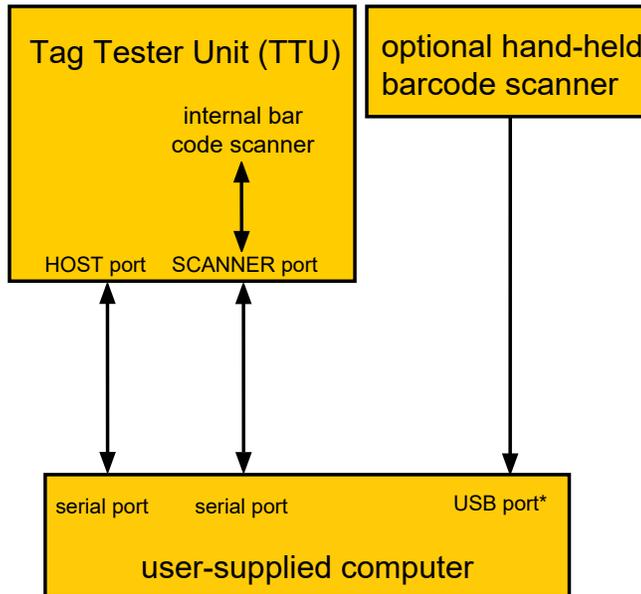
* several options are available
  for connecting the hand-held
  bar code scanner to the computer

3. OPERATING PROCEDURES

Starting up the T600 tag tester

The T600 Tag Tester start up procedure involves turning on the Tag Tester Unit (TTU) and launching the T600 software application.

Prerequisites: You must first install the T600 software and hardware.
Contact Kapsch TrafficCom for the latest agency mapping file (see page 39 for upgrading mapping file procedure).

1. Set the power switch on the back of the TTU to the on position. The TEST IN PROGRESS LED illuminates solid red for a few seconds.

2. Launch the T600 PC software as Administrator by right-clicking T600TagTester.exe on the customer-supplied computer and select **Run as administrator** option. You are now ready to test OBUs.

Testing a tag

Testing a tag involves correctly orienting the OBU in the cradle of the TTU and manually initiating testing. The T600 tag tester then automatically conducts the various tests.

Prerequisites: - You must maintain a minimum of 1ft. between the TTU and OBUs not being tested.
- You must first enter text in the **User/Comment** box.

> **CAUTION:**
>
> Ensure the OBUs are placed correctly in the TTU cradle. Operational OBUs could fail if not oriented correctly in the cradle.

1. Place the OBU in the TTU cradle. Ensure the OBU is properly aligned (see' **Note**: Correct orientation of the G4 OBUs in the TTU cradle', page 50).

2. Remove your hand from the T600 test chamber.

> **WARNING:**
>
> DO NOT STARE DIRECTLY AT THE LASER BEAM OR ANY SECONDARY REFLECTIONS EMITTING FROM THE INTERNAL TTU BAR CODE SCANNER. LASER LIGHT CAN CAUSE EYE INJURY AFTER PROLONGED EXPOSURE. THE INTERNAL TTU BAR CODE SCANNER EMITS CLASS 2 LASER LIGHT.

> **NOTE:** Do not move or remove the OBU while the test is in progress. The test aborts if the proximity sensor cannot detect the OBU in the TTU cradle.

3. Click <mark>Test Start</mark> or press CTRL+A to begin testing. The Test in Progress message displays on the user interface and the TEST IN PROGRESS LED on the front of the TTU illuminates red.

4. If the T600 cannot read or recognize the OBU data and the internal bar code scanner cannot read the OBU bar code, you are prompted to manually enter the bar code number (see 'Entering the OBU bar code number', page 22). You cannot proceed until you enter a valid bar code number.

5. After a few seconds, testing completes and the test result displays at the bottom of the T600 user interface. Remove the OBU from the TTU. The T600 Tag Tester is ready to test the next OBU.

6. If the OBU fails the tag test, contact Kapsch TrafficCom Canada Inc. to arrange an RMA so the OBU can be returned.

Entering the OBU bar code number

If the TTU cannot read or recognize an OBU in its cradle during testing, it scans the OBU bar code. If the TTU cannot scan the OBU bar code, you must manually enter the bar code information or scan the OBU bar code with the optional hand-held scanner.

Prerequisites: - The Transponder Bar Code Label window (Figure 3-1) is active.
- To use the optional hand-held bar code scanner, the scanner must be installed according to the manufacturer's instructions.

1. Remove the OBU from the TTU cradle.

	WARNING:
⚠	DO NOT STARE DIRECTLY AT THE LASER BEAM EMITTING FROM THE HAND-HELD BAR CODE SCANNER. LASER LIGHT CAN CAUSE EYE INJURY AFTER PROLONGED EXPOSURE. THE HAND-HELD BAR CODE SCANNER IS A CLASS 2 LASER PRODUCT.
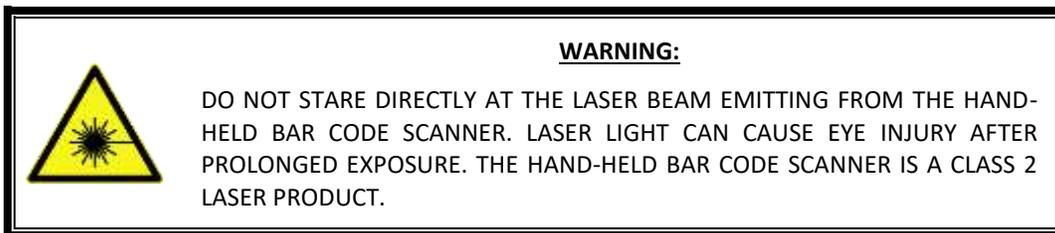
2. If the optional hand-held bar code scanner is installed, scan the OBU bar code.

3. If the optional hand-held scanner is not installed or it cannot scan the bar code, use the customer-supplied computer keyboard to enter the number on the bar code label in the Transponder Barcode Label dialog box (Figure 3-1). You cannot proceed until you enter a valid bar code number.

4. Once the bar code number has been entered, the test results are displayed on the user interface.

Figure 3-1: The Transponder Barcode Label Window.

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Understanding the T600 test data

A variety of information about the OBU is displayed in the Test Results area after a test.

Table 3-1: Burst Test Read Results Explained

Read Result field	Information displayed
Successes	The number of successful reads during the burst test.
Fail CRC	The number of reads that failed as a result of a bad CRC.
Fail timeout	The number of reads that failed as a result of an OBU not communicating within the allowable time.

Table 3-2: Burst Test Write Results Explained

Write Result field	Information displayed
Successes	The number of successful writes during the burst test.
Fail CRC	The number of writes that failed as a result of a bad CRC.
Fail timeout	The number of writes that failed as a result of an OBU not communicating within the allowable time.
Fail verify	The number of writes that failed because a successful write could not be confirmed.

Table 3-3: Margin Test Results Explained

Margin field	Information displayed
Read	The attenuation value, between 0 and 15 dB, that allows the OBU to be read successfully.
Write	The attenuation value, between 0 and 15 dB, that allows the OBU to be written to successfully.

Configuring log files

The T600 can be configured to record all OBU tests or just OBU tests that result in a failure. These records are added to a user-specified log file.

Prerequisites: None.

1.   From the Log File information area of the T600 software interface, enter your user information (e.g. your user ID) in the **User/Comment** box. This information appears in each log file record.

2.   If you want records for every OBU test, clear the **Log only failed tests** check box.

3.   If you want records only for OBU test failures, select the **Log only failed tests** check box.

4.   If you want to record test results to the Log file displayed in the Log File field, no action is required.

5.   If you want to specify a new log file:

   a)   Click on New Log file.

   b)   Select the text file you want to record test results to. Click **Open**.

   c)   If the text file does not yet exist, create the text file and repeat step b.

   d)   The new log file path is displayed in the Log File field of the Log File information area and is ready to record test results.

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Command and Controls

Command	How is this command executed?	Who can execute this command?	What does this command do?	What is the purpose of this command?
Exit	From the **File** drop-down menu, click **Exit**.	anyone	Closes the T600 Tag Tester software.	To exit the T600 Tag Tester software.
Serial Data Window	From the **Settings** drop-down menu, click **Serial Data Window**.	anyone	Opens the **Serial Data Window**.	To monitor data to and from the customer-supplied computer.
Configuration	From the **Settings** drop-down menu, click **Configuration**.	anyone	Opens the **Configuration Dialog** window.	To access the T600 Tag Tester configuration settings.
About T600 Tag Tester	From the **Help** drop-down menu, click **About T600 Tag Tester**.	anyone	Opens the **About T600 Tag Tester** window.	To view the T600 Tag Tester version information.
Test Start	Click on Test Start, or, press CTRL+A	anyone	Starts the margin and burst test.	To initiate testing after an OBU has been placed in the TTU cradle.

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Command	How is this command executed?	Who can execute this command?	What does this command do?	What is the purpose of this command?
Test Stop	Click on Test Stop, or, press CTRL+E	anyone	Stops the margin and burst test.	To abort a test in progress.
Calibrate	Click on Calibrate, or, press CTRL+L	anyone	Opens the Calibration screen. (opens the TTU Serial Number tab in the Configuration window if a TTU serial number has not been entered).	To access calibration functions.
Ignore tag type mismatches for tags being calibrated	Click on Calibrate, then, select the **Ignore tag type mismatches for tags being created** check box.	Kapsch service personnel	Allows results from one tag type to be used to calibrate a different tag type.	To use the calibration parameters of one tag type to be used for another tag type.
Clear calibration data	Click on Calibrate, then, click on **Clear calibration data**.	Kapsch service personnel	Opens the Password window.	To clear calibration data.
Perform margin test	Click on Calibrate, then, click on **Perform margin test**.	Kapsch service personnel	Opens the Password window.	Starts the calibration margin test.

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Command	How is this command executed?	Who can execute this command?	What does this command do?	What is the purpose of this command?
Accept	After a calibration margin test returns Read and Write dB values, click on **Accept.**	Kapsch service personnel	Accepts the calibration margin test results.	To use the Read and Write calibration margin test results as the criteria for OBU tests of this type.
New Log File	Click on **New Log File**.	anyone	Opens the **Open** file window.	To specify to which text file new log records are added.
Log Only Failed Tests	Select the **Log Only Failed Tests** check box.	anyone	Sets the T600 to only log tag failures to the log file.	Enabled: to log only failed tag tests to the log file. Disabled: to log all tag tests to the log file.
Comm. Port (T600)	From the Communication tab in the Configuration Dialog window, select the computer COM port that is connected to the T600 HOST port from the T600 **Comm. Port** drop-down box, then, Click **OK**.	anyone	Establishes which computer COM port is connected to the T600 HOST port.	To establish which computer COM port is connected to the HOST port.

Command	How is this command executed?	Who can execute this command?	What does this command do?	What is the purpose of this command?
Baud Rate (T600)	From the Communication tab in the Configuration Dialog window, select the baud rate for the computer COM port that is connected to the T600 HOST port from the T600 **Comm. Port** drop-down box, then, click **OK**.	anyone	Establishes the baud rate for communications between the customer-supplied computer and the TTU.	To establish the HOST port baud rate.
Comm. Port (Scanner)	From Communication tab in the Configuration Dialog window, select the computer COM port that is connected to the T600 SCANNER port from the Scanner **Comm. Port** drop-down box, then, click **OK**.	anyone	Establishes which computer COM port is connected to the T600 SCANNER port.	To establish which computer COM port is connected to the internal T600 bar code scanner.
TTU serial number	From the TTU Serial Number tab in the Configuration Dialog window, enter the TTU serial number (found on the back of the TTU) in the **TTU serial number** box, then, click **OK**.	anyone	Establishes the TTU serial number.	To ensure the computer is connected to the correct TTU. Also, if multiple calibration files are installed, to ensure the correct calibration file is used.

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Command	How is this command executed?	Who can execute this command?	What does this command do?	What is the purpose of this command?
Change configuration data	From the T600 Tag Tester Configuration Tab in the Configuration window, click on **Change configuration data**.	Kapsch service personnel	Opens the Password window.	To allow Kapsch TrafficCom Canada Inc. personnel to change the T600 configuration settings.
Clear (serial data)	From the Serial Data Dialog window, click on **Clear** from the **File** drop-down menu.	anyone	Clears the data in the Serial Data Dialog window.	To discard old serial data so only the latest serial data is displayed.
Save PDU data	From the Serial Data Dialog window, click on **Save PDU data** from the **File** drop-down menu.	anyone	Opens the **Save As** window.	To save a copy of the PDU data currently displayed in the Serial Data Dialog window.
Freeze Screen	From the Serial Data Dialog window, click on **Freeze Screen** from the **File** drop-down menu.	anyone	Prevents the Serial Data Dialog window from updating with new data.	To prevent serial data from being overwritten so it can be examined.

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MAINTENANCE INSTRUCTIONS

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4. THEORY OF OPERATIONS

This section offers more details on T600 tag testing and calibration than the introductory overview provided in the Overview on page 15.

Calibration

Calibration can only be performed by Kapsch service personnel. During calibration, a gold standard OBU is used to determine which margin levels are detected by that particular TTU. These margin levels then become the test criteria for that OBU type. OBUs fail the margin test if they give margin test results that fall outside the test criteria by +/- 2 dB.

The write tests

Toll collection data and traffic management data is not overwritten during the margin and burst write tests. During a write test, the same data that was obtained during the read test is written back to the OBU. Additionally, a reserved memory bit is set to 1 during a write test. Because this bit is set to 0 at the factory, and this bit can only be changed by the T600, a value of 1 indicates the OBU has been successfully tested by a T600.

The burst tests

The burst tests ensure the OBU can be read and written to consistently. The TTU RF signal attenuation is decreased by 3 db. The TTU then performs 50 reads and 50 writes. To pass the Read burst test, 90% of the 50 reads must be successful; to pass the Write burst test, 80% of the 50 writes must be successful.

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5. INSTALLATION

The installation steps are outlined below. Begin installation by making the necessary hardware connections. After installing the T600 hardware, install the software on the customer-supplied computer connected to the T600. Once you have installed the software, launch the software and perform the configuration procedures.

System requirements for customer-supplied computer

The customer-supplied computer must meet the following requirements in order to run the T600 software and successfully communicate with the T600 tag tester.

Operating system: Windows XP, Windows 7, Windows 8 /8.1

COM ports: two available RS-232 serial ports (DB9).

USB ports: one available USB port if using the hand-held bar code scanner.

Installing the T600 hardware

You need to connect the power cables to the TTU and the communication cables between the TTU and the customer-supplied computer. If you have the optional hand-held bar code scanner, you need to connect it to the computer.

Prerequisites: - Ensure a minimum of 10 ft. between TTUs.
                   - Ensure a minimum of 3 ft. between a TTU and a T500 Tag Programmer.
                   - Ensure a minimum of 1ft. between the TTU and OBUs not being tested.

T600 connections

1. Connect one end of the serial null-modem cable to the HOST port on the back of the TTU. Connect the other end to a computer COM port.

2. Connect one end of the serial scanner cable to the SCANNER port on the back of the TTU. Connect the other end to a computer COM port.

3. Connect the TTU power supply to the AC outlet. Connect the power supply cable to the power connector on the back of the TTU.

Optional hand-held bar code scanner connections

4. Connect and configure the hand-held bar code scanner as outlined in the manufacturer's instructions (Symbol LS2208 Product Reference Guide, 72E-58808-07).

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Installing the T600 software

Install the software on the customer-supplied computer using the supplied CD.

Prerequisites: You need a computer that meets the system requirements (see 'System requirements for customer-supplied computer', page 36).

1. Insert the T600 software CD in the PC CD drive. Follow the instructions provided by the InstallShield Wizard. If the InstallShield Wizard does not automatically launch, double-click the **setup.exe** file from the T600 software CD.

2. After the InstallShield Wizard welcome screen appears, and then click **Next** to proceed.

3. After reviewing the license agreement, select I accept the terms in the license agreement and then click **Next**.

4. Review the Readme Information and then click **Next**.

5. Enter a user name and organization name in the appropriate text boxes.

6. Under **Install this application for**, select **Anyone who uses this computer** so the T600 software can be accessed by all users. Click **Next**.

7. Select the destination folder where the software will be installed and then click **Next**.

   > **Note** : Instead of using the default folder
   > C:\Program Files (x86)\Kapsch TrafficCom IVHS\T600 Tag Tester <version>,
   > select **C:\Users\myUserName\Kapsch TrafficCom IVHS\T600 Tag Tester <version>**
   > in order to have full control (read / write) permissions of folder & files.

8. Review the installation settings. Select **Back** to return to the previous installation steps and make changes as needed.

9. Click **Install** to begin installation.

10. After the installation is completed, click **Finish** to exit InstallShield Wizard.

11. Launch the T600 software as Administrator by right-clicking the executable **T600TagTester.exe** and select **Run as administrator** option.

12. Enter the TTU serial number.

13. Click **Settings → Configuration**. The **Configuration Dialog** window opens.

14. In the **TTU Serial Number** tab, enter the serial number found on the back of the TTU.

15. Click **OK**.

The software installation is complete.

Constraints:

Followings are only applied to Windows Vista and above with the installation folder under C:\Program Files (x86).

Due to security feature User Account Control (UAC) introduced since Windows Vista, any non-Administrator program that tries to write to protected locations such as "Program Files" will get their writes caught and redirected to an alternative location, Virtual Store.

Most programs in Windows including T600 do not run as an administrator even if you are signed into an admin account.

In our case, if T600 attempts to write to files in folder eg. "C:\Program Files (x86)\Kapsch TrafficCom IVHS\T600 Tag Tester 1.11.06.23" such as log files, the write will get redirected to "C:\Users\username\AppData\Local\VirtualStore\Program Files (x86)\Kapsch TrafficCom IVHS\T600 Tag Tester 1.11.06.23".

To avoid triggering the use of Windows Virtual Store, run T600 PC software as Administrator by right-clicking the executable T600TagTester.exe and select **Run as administrator** option. If necessary, use **Windows Explorer** to copy calibration files and agency mapping file to the T600 installation folder in C:\Program Files (x86).

Installing the calibration files

Optional calibration files, unique to each tag tester, may have been provided by Kapsch TrafficCom Canada Inc.. Installing these files provides the initial calibration of the T600. The IVHS installer must generate or obtain the OBU calibration files. They are not present on the supplied CD.

Note: If you do not have the optional calibration files for the specific T600 you want to calibrate, contact Kapsch TrafficCom Canada Inc. to arrange calibration (see constraints in page 37 for copying the calibration files).

Prerequisites: You must have a copy of the calibration files provided for the specific T600 tag tester.

1. Use **Windows Explorer** to copy the calibration files (*.CAL) into the folder created in: 'Installing the T600 software', page 37, step 1.

NOTE:	It is possible to have calibration files for multiple tag testers in the same directory. The tag tester software identifies the correct calibration file based on the TTU serial number in the name of the calibration file.

2. Ensure that the serial number in the calibration file name matches the TTU serial number.

    a) Launch T600 PC software as Administrator by right-clicking the executable T600TagTester.exe and select **Run as administrator** option.

    b) Click **Settings→Configuration**. The Configuration Dialog window opens.

    c) Ensure the number in the TTU Serial Number tab matches the number in the calibration file name.

    d) If these numbers do not match, ensure you have the correct calibration file. If the file is correct, but the file name is wrong, rename the file with the correct TTU serial number.

Installing /Upgrading the agency mapping file

The agency mapping file T600Cfg.xml included in the supplied CR-ROM /software package is installed when installing the T600 PC software.

To install updates on the agency mapping file provided by Kapsch TrafficCom (see constraints in page 37), follow these steps.

1. Use **Windows Explorer** to copy the agency mapping file **T600Cfg.xml** into the installation folder created in Installing the T600 software on page 37.

2. Launch the T600 software as Administrator by right-clicking the executable **T600TagTester.exe** and select **Run as administrator** option to have the new mapping file take effect.

Note: User is advised NOT to modify the agency mapping file. Incorrect settings may cause improper function of the T600 Tag Tester. Contact Kapsch TrafficCom for new update on the file.

Configuring the T600 tag tester communication settings

You must configure communications between the customer-supplied computer and the TTU and its internal scanner before OBU testing begins.

Prerequisites: - The T600 hardware and software is installed.
- You must know the COM port numbers of the computer serial ports which connect to the T600 hardware.

Configuring communications between the TTU and the computer

1. Click **Settings→Configuration**. The Configuration Dialog window opens.

2. Click on the Communications tab in the Configuration Dialog window.

3. Select the computer COM port that connects to the TTU HOST port from the T600 Comm. Port drop-down box.

4. Select 9600 from the T600 Baud Rate drop-down box. Click **OK**.

5. Ensure the computer COM port that connects to the TTU HOST port is set to 9600 bps.

Configuring communications between the internal bar code scanner and the computer

6. Click **Settings→Configuration**. The Configuration Dialog window opens.

7. Click on the Communications tab in the Configuration Dialog window.

8. Select the computer COM port that connects to the TTU SCANNER port from the Scanner Comm. Port drop-down box. Click **OK**.

9. Exit and relaunch the T600 software for changes to take effect.

ATTENTION: The following sections:

- Agency mapping file configuration for tag types

- How to identify interior OBU (G4E) from the older model FPT (G3B)

- How to identify exterior OBU (FME) from the older model LPT

apply to Kapsch service personnel.

Agency mapping file configuration for tag types

The new model Interior OBU (G4E) is used to replace the old model FPT (G3B) which shares the same type# 0

The new model Exterior OBU (FME) is used to replace the old model LPT which shares the same type# 2.

To identify the model of a tag, the tag serial number is used.

The serial number ranges for the new models are specified in the agency mapping file T600Cfg.xml. If a tag serial number is not specified, the default is the old model.

The following table lists the Tag types and their descriptions.

Table 5-1: Tag Types Descriptions

Tag Type	Name	Type #	Calibration File	Remarks
FTP	G3B	0	T600 <s/n> FPT calibration history file.cal	
Exterior FTP	RMT	1	T600 <s/n> Exterior FPT calibration history file.cal	
Interior OBU	G4E	0	T600 <s/n> Interior OBU calibration history file.cal	Replaces older model FPT (G3B). Identified by tag serial#.
Feedback OBU		5	T600 <s/n> Feedback OBU calibration history file.cal	

Tag Type	Name	Type #	Calibration File	Remarks
Exterior OBU	FME	2	T600 <s/n> Exterior OBU calibration history file.cal	Replaces older model LPT. Identified by tag serial#.
Toll / Balance		3	T600 <s/n> Toll Tag calibration history file.cal	
HOT / HOV		6	T600 <s/n> HOT calibration history file.cal	

Note: It is required to specify the range of the tag serial# for the new model in the agency mapping file (T600Cfg.xml) in order for the application to pick the correct tag type and the required calibration file for testing.

How to identify Interior OBU (G4E) from the older model FPT (G3B)

Since the Interior OBU (G4E) and the older model FPT (G3B) share the same type# (0), use the tag serial number to differentiate them.

1. Open Microsoft WordPad.

2. In WordPad, open T600Cfg.xml.

   Note: **T600Cfg.xml** is located in the same directory as the executable **T600TagTester.exe**.

3. To specify the tag serial number range for G4E model, go to the appropriate Agency ID to make the changes. Refer to the Examples below.

4. On the line with Tag Model="G4E", change the field value of **SerialNum_Start** and **SerialNum_End** to the start and end of the tag serial number which are non-zero for the G4E model respectively.

   Note: If there are multiple serial number ranges, use multiple lines with each line specifying one number range.

5. Click **Save** in WordPad to save the file

6. Restart T600 application, **T600TagTester.exe**, for the new settings to take effect.

   Note: If the agency mapping file is not found, or corrupted when the application starts, a new file will be generated with "0" as the default value of **SerialNum_Start** and **SerialNum_End** for the G4E model for all agencies. This means that all tags with type# 0 will be identified as the old model FPT (G3B).

How to identify Exterior OBU (FME) from the older model LPT

Since the Exterior OBU (FME) and the older model LPT share the same type# (2), use the tag serial number to differentiate them.

1. Open Microsoft WordPad.

2. In WordPad, open T600Cfg.xml.

   Note: **T600Cfg.xml** is located in the same directory as the executable **T600TagTester.exe**.

3. To specify the tag serial number range for FME model, go to the appropriate Agency ID to make the changes. Refer to the Examples below.

4. On the line with Tag Model="FME", change the field value of **SerialNum_Start** and **SerialNum_End** to the start and end of the tag serial number which are non-zero for the FME model respectively.

   Note: If there are multiple serial number ranges, use multiple lines with each line specifying one number range.

5. Click **Save** in WordPad to save the file

6. Restart T600 application, T600TagTester.exe, for the new settings to take effect.

   Note: If the agency mapping file is not found, or corrupted when the application starts, a new file will be generated with "0" as the default value of **SerialNum_Start** and **SerialNum_End** for the FME model for all agencies. This means that all tags with type# 2 will be identified as the old model LPT which is NOT supported in T600 and cannot be tested.

Examples

Example 1:   The default serial number range of "0" on both G4E and FME for agency "Kapsch" will have all tags of type#0 and type#2 identified as the old model, FPT (G3B)and LPT respectively.

```
<Agency ID="0" Name="Kapsch">
<Tag Model="G4E" SerialNum_Start="0" SerialNum_End="0" />
<Tag Model="FME" SerialNum_Start="0" SerialNum_End="0" />
</Agency>
```

Example 2:   Change serial number range to full range with start at "1" and end at "16777215" on both G4E and FME for agency "Kapsch" will have all tags of type#0 and type#2 identified as the new model, Interior OBU (G4E) and Exterior OBU (FME) respectively.

```
<Agency ID="0" Name="Kapsch">
<Tag Model="G4E" SerialNum_Start="1" SerialNum_End="16777215" />
<Tag Model="FME" SerialNum_Start="1" SerialNum_End="16777215" />
</Agency>
```

Example 3:   If serial number range for a particular model is not contiguous, specify the range start and end number.
In the following example,
```
FPT (G3B)          :   1 - 99999,  200001 - 399999
Interior OBU (G4E)  :   100000 - 200000,  400000 - 16777215
LPT                :   1 - 49999,  80001 - 89999
Exterior OBU (FME)  :   50000 - 80000,  90000 - 16777215
```

```
<Agency ID="0" Name="Kapsch">
<Tag Model="G4E" SerialNum_Start="100000" SerialNum_End="200000" />
<Tag Model="G4E" SerialNum_Start="400000" SerialNum_End="16777215" />
<Tag Model="FME" SerialNum_Start="50000" SerialNum_End="80000" />
<Tag Model="FME" SerialNum_Start="90000" SerialNum_End="16777215" />
</Agency>
```

6. TROUBLESHOOTING AND TESTING

Troubleshooting trees are provided for resolving the most common T600 tag tester error messages. Because the T600 is a tag tester, it is normal to receive tag failure messages. However, failures can also occur because of an issue with the TTU. Review this section to understand which errors are a valid result of an OBU failure and which are a result of an issue with the T600 tag tester itself.

The error messages in Table 6-1 indicate OBU failures. Ensure the OBU is properly orientated in the TTU cradle before reporting a failed OBU.

Table 6-1: Error Messages Indicating a Tag Failure

Error Message	Description
No response from tag.	There was no response from the OBU during testing, even at the highest signal level.
Bad CRC transponder	There were no good reads and more than half of the reads resulted in a bad CRC.
Invalid tag Group ID	The Group ID is not valid
Bar code mismatch with tag contents	The serial number and/or Agency ID stored in the OBU do not match the OBU bar code.
Read margin exceeds limits	The attenuation decrease required to read the OBU is below the acceptable range.
Write margin exceeds limits	The attenuation decrease required to write to the OBU is below the acceptable range.
Read performance below limit	The number of successful reads during the burst test is below the acceptable range.
Write performance below limit	The number of successful writes during the burst test is below the acceptable range.

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Troubleshooting tree: Communications error - Check serial connection

```
┌─────────────────────────────┐
│ START                       │
│        Symptom:             │
│ Error message: Check serial │
│ connection between PC and   │
│ T-600, T-600 power or the   │
│ PC COM port.                │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│ Ensure that the TTU         │
│ power switch is in the      │
│ on position.                │
└─────────────────────────────┘
              │
              ▼
        ╱─────────╲           No    ┌──────────────┐
       ╱ Does the   ╲ ─────────────▶ │ The error is │
       ╲ error       ╱              │ resolved.    │
        ╲ message   ╱               └──────────────┘
         ╲ persist? ╱
          ╲───────╱
              │ Yes
              ▼
┌─────────────────────────────┐
│ Inspect the cable and       │
│ connections between         │
│ the computer and the        │
│ TTU HOST port.              │
└─────────────────────────────┘
              │
              ▼
        ╱─────────╲           No    ┌──────────────┐
       ╱ Does the   ╲ ─────────────▶ │ The error is │
       ╲ error       ╱              │ resolved.    │
        ╲ message   ╱               └──────────────┘
         ╲ persist? ╱
          ╲───────╱
              │ Yes
              ▼
┌─────────────────────────────┐
│ Ensure the                  │
│ communication settings      │
│ are properly configured.    │
└─────────────────────────────┘
              │
              ▼
        ╱─────────╲           No    ┌──────────────┐
       ╱ Does the   ╲ ─────────────▶ │ The error is │
       ╲ error       ╱              │ resolved.    │
        ╲ message   ╱               └──────────────┘
         ╲ persist? ╱
          ╲───────╱
              │ Yes
              ▼
                        ┌─────────────────────┐
                        │ Contact Kapsch for  │
                        │ Service Assistance. │
                        └─────────────────────┘
```

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Troubleshooting tree: Test Fail - Tag position failure (IR Beam)

An Infra-Red(IR) sensor located in the TTU cradle detects when an OBU has been placed in the cradle.

```
START
         Symptom:
Error message: Tag position failure
(IR beam).
```
↓
```
Check that an OBU is
properly positioned in
the TTU cradle.
```
↓
```
Does the error        No       The error is
message persist?      →        resolved.
```
Yes ↓
```
Check that the IR sensor
beam is not blocked by
any foreign objects.
```
↓
```
Does the error        No       The error is
message persist?      →        resolved.
```
Yes ↓
```
Contact Kapsch for
Service Assistance.
```
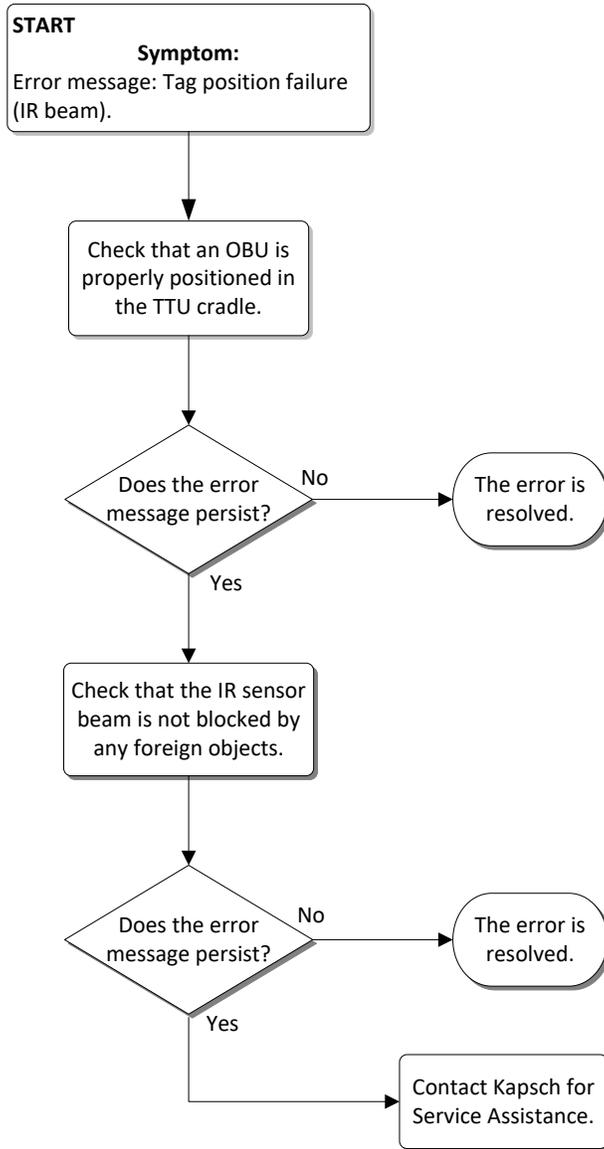
Troubleshooting tree: Tag Fail - Bar code mismatch with tag contents

This mismatch error occurs when the Agency ID and/or serial number information stored in the OBU does not match that contained in the bar code information. The TTU antenna and internal bar code scanner are working properly; the problem is with the OBU.

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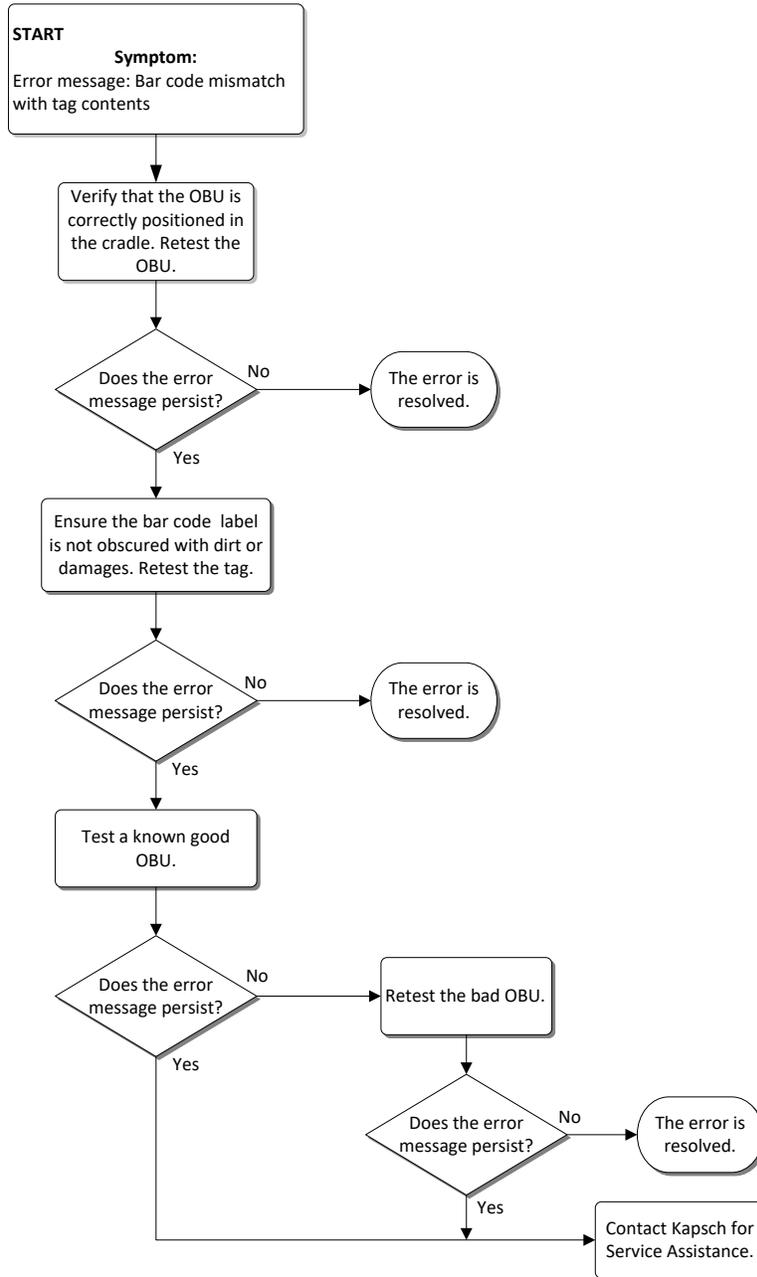
The internal TTU bar code scanner cannot read the OBU bar code

An OBU can pass the tag test, even if its bar code was not read successfully. When this happens, an error message is not generated, but the **Label Agency ID** and **Label Serial Number** fields in the **Bar code Data** area display **Unreadable**.

The TTU cannot read the OBU bar code or the OBU tag data

If the TTU cannot read the OBU bar code or the OBU tag data, you are prompted to manually enter the bar code information (see 'Entering the OBU bar code number', page 22). You cannot proceed until a valid bar code number is entered.

Resolving a missing calibration file error

If the T600 attempts to test an OBU, and the T600 cannot locate a calibration file for that OBU type, the T600 displays this error message: This model can't be tested, perhaps due to a missing calibration file. Check that the proper calibration file exists:

1. Click Calibrate.

2. Check that there is a calibration file listed for the OBU type you are trying to test.

3. If the OBU type is not listed, or the file type is marked with a red X and not a green checkmark, the calibration file cannot be located.

To find a missing calibration file:

4. Note the TTU serial number.

5. Look in the folder containing the T600 files. Check all calibration files (*.cal). The correct calibration file will have the TTU serial number and tag type in the file name.

6. If the calibration file cannot be found, contact Kapsch TrafficCom Canada Inc. to have the T600 calibrated for that OBU type.

TTU functional check

After 100 consecutive OBU tests that result in **No response from tag**, the Functional Check Requirement message window appears (see Figure 6-1). Perform the following procedure before contacting Kapsch TrafficCom Canada Inc..

Figure 6-1: The Functional Check Requirement message

1. Test a known good OBU.

2. If the known good tag passes the test and the functional check requirement message does not appear, the TTU is functioning properly.

3. If the functional check requirement message appears after testing the known good tag, test two additional known good tags.

4. If the functional check requirement message appears after testing three known good tags, create a new log file (see 'Configuring log files', page 25), change the text in the **User/Comment** box, then retest three known good tags.

5. If the functional check requirement message appears after retesting three known good tags, contact Kapsch TrafficCom Canada Inc..

Sending Log Files to Kapsch TrafficCom Canada Inc.

The log files generated by the T600 contain important information about the tags tested. Kapsch may request theses log files to assist in troubleshooting.

1. Obtain a RMA number from Kapsch TrafficCom Canada Inc.

2. Rename the log file to include the RMA number.

3. Email the log file in its original format to Kapsch TrafficCom Canada Inc.

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7. MAINTENANCE PROCEDURES

Preventive maintenance procedures and scheduling

Every four months:

Using a vacuum, remove any loose contaminants from the OBU cradle. If necessary, use a slightly damp cloth to remove sticky grime.
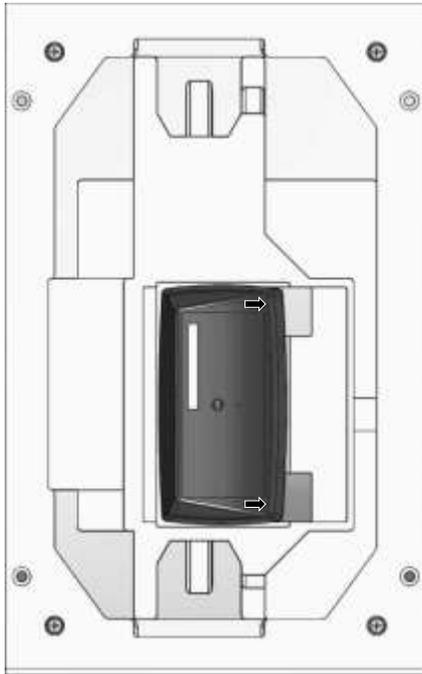
Every six months:

Have the T600 tag tester calibrated. The T600 must only be calibrated by Kapsch TrafficCom Canada Inc. service personnel.

8. APPENDIX

Note: Correct orientation of the G4 OBUs in the TTU cradle is in direction of the arrows. G4 OBU indicates the G4 family (G4E, G4F, and G4P).

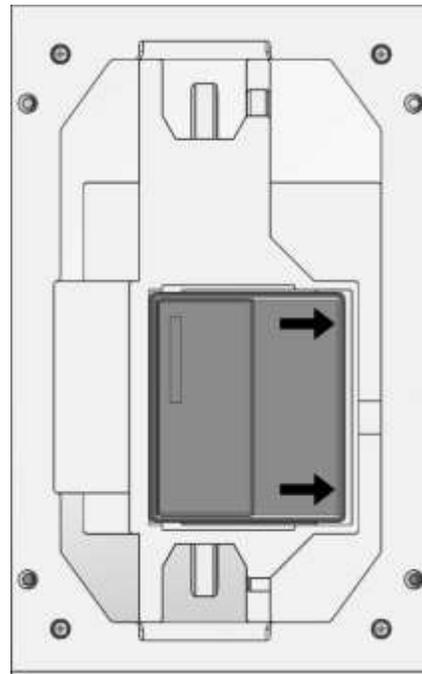| **Figure 8-1: G4 OBU**	**Figure 8-2: Flat Pack Transponder (FPT)**

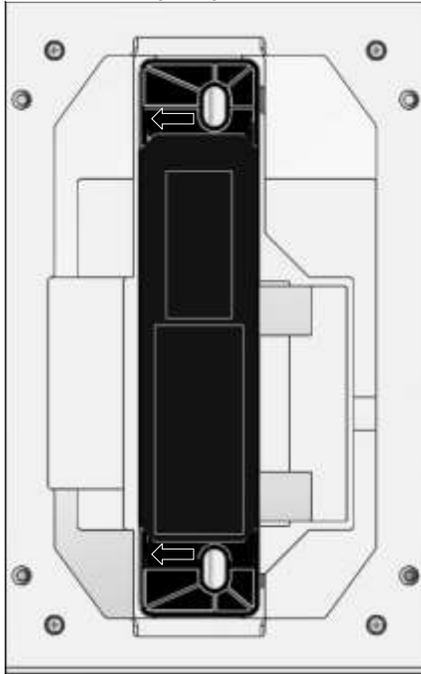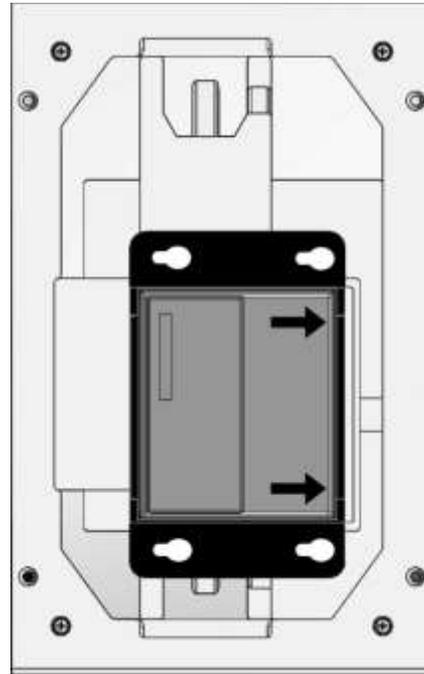**Figure 8-3: Front Mount Exterior (FME) OBU**

Figure 8-4: Roof Mount FTP

**Figure 8-5: Front Mount OBU –
Motorcycle**

Figure 8-6: High Occupancy Toll (HOT) OBU
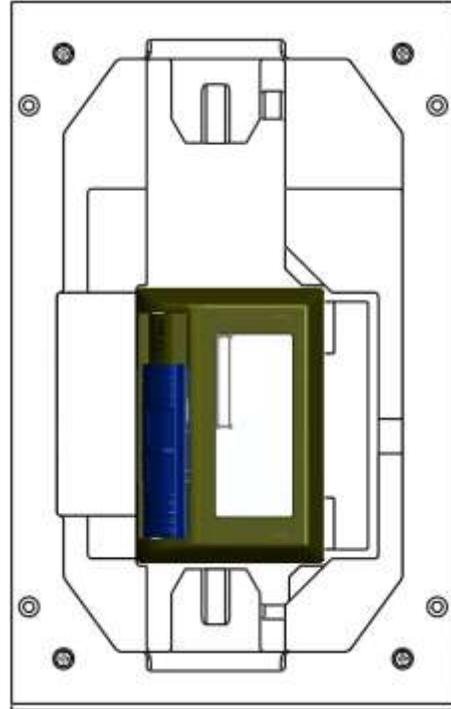
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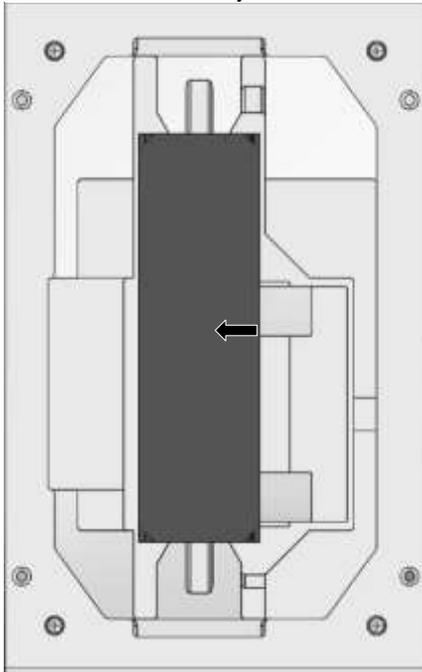
Reference documents

Kapsch TrafficCom Canada Inc. documents

PRO 360420-800	Product Requirement Outline – T600 Tag Tester
TS 360420-810	Technical Specification – T600 Tag Tester

Other commercial documents:

72-71882-01 Rev. D	LS2208 Quick Start Guide [English]
72E-58808-07 Rev. A	Symbol LS2208 Product Reference Guide

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Accessing documentation

You can access the documentation package for the T600 Tag Tester online at **http://dds.kapsch.ca/** A Username and Password can be obtained from Kapsch TrafficCom Canada Inc.

The documentation package includes:

- Bill of Materials

- Assembly Drawings

- Schematic Drawings

- Parts Specifications (for purchased items)

- Operator and Maintenance Manuals

- Installation Instructions

- Software Design Documents (Context Diagrams, Data Flows, etc.)

- As-built installation drawings (services)

Acronyms

Table 8-1: Acronyms

Term	Meaning	Reference or example
AC	Alternating current	
bps	bits per second	a measure of baud rate
COM	communication	COM ports
CRC	Cyclic Redundancy Check	
FME	Front-Mount Exterior	a type of OBU
ID	identification	
IR	Infra-Red	an infra-red beam is used by the proximity sensor to detect the presence of OBUs in the tag cradle.
IVHS	Intelligent Vehicle Highway System	

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OBU	On Board Unit	a tag or transponder
PDU	Protocol Data Unit	data passed over a network
RMA	Return Merchandise Authorization	
TTU	Tag Tester Unit	