



JANUARY 2023

GARRETT MOTION HANDYCAN3 PORTABLE E-ACTUATOR TESTER OPERATING INSTRUCTIONS

Revision D

Garrett
ADVANCING MOTION

What is the HandyCAN3 Tester

- HandyCAN3 is a tester for electronic actuators fitted to Garrett turbochargers and was designed specifically for the IAM to reduce instances of No Fault Found due to misdiagnoses of suspected faults
- It is designed to be easy to use and with simple, clear, unambiguous results which need no further analysis or decoding
- Based on our HandyCAN 2 Tester used by Honeywell Field Engineers and Warranty Service (REA only!) but with added functionality to test SREA and much simpler to use
- HandyCAN 3 tests all past and current versions of REA & SREA which are manufactured by Hella exclusively for Honeywell Turbo Technologies
- 7 Different variants of hardware
- It is designed to carry out a number of tests quickly, either on or off the vehicle (access permitting) to determine if the electronic actuator is working correctly or not
- Menu driven which also allows manual intervention if required
- Clear instructions on screen during testing
- Testing takes minutes

Design criteria was: simple and quick to use

What is the HandyCAN3 Tester

- Simple to use “Go or No Go” type tester
- Results are simply:
 - Actuator Passed Testing
 - Actuator Failed Testing
 - Vanes Passed Testing
 - Vanes Failed Testing

To help reduce increasing costs of unnecessary warranty claims within IAM Distributor

True failure rates of e-actuators are extremely low

Security Feature – License Key

- The HandyCAN 3 incorporates a SECURITY FEATURE designed to safeguard your property. If the HandyCAN 3 is stolen or mislaid and an unauthorized person attempts to use it, the tester will cease to function after a pre-set period.
- The HandyCAN 3 has a built in timer to allow you to use it for up to 3 months and then after that date, follow a simple procedure to re-license it. The process assures minimum inconvenience for you, the authorized user, but if an unauthorized person attempts to re-license your units, the HandyCAN 3 will lock down and prevent use.

This ensures that your HandyCAN 3 will be useless to a thief!

- To re-license your HandyCAN 3, please use the process on pages 36 to 44

3 months license key feature can no longer be renewed

To remove the 3 months license key feature please log in to:

<https://www.garrettmotion.com/knowledge-center-category/turbo-replacement/handycan3/>

and download the latest firmware to update your HandyCAN3 device as explained in January 2023 Tech Bulletin 01 “HandyCAN3 Portable Tester firmware update for 3 months license cancellation”

Important Safety notes

- **SAFETY NOTE 1:**

- It is important to fully read these operating instructions before attempting to use HandyCAN3

- **SAFETY NOTE 2:**

- When testing Garrett e-actuators, the tester will move the output crank of the actuator and also vanes operating mechanism on the turbo. Electronic actuators produce a lot of power when operating.

IT IS IMPORTANT TO ENSURE THAT HANDS, FINGERS AND LOOSE CLOTHING ARE KEPT AWAY FROM THESE AREAS DURING THE TEST PROCESS TO AVOID INJURY.

- **SAFETY NOTE 3:**

- During the test process, the tester will display screens to remind the user of these safety notes.

Please follow instructions carefully to avoid injury

Garrett HandyCAN 3 Tester

- 1 The HandyCAN 3 tester is supplied as follows:



Garrett HandyCAN 3 Tester

Supplied components

- 1 Intelligent battery charger. Cannot overcharge or damage batteries.
 - The charger may be left connected to 'trickle charge' the batteries when the tester is not in use.
- 2 Serial port connector lead.
 - Used for updating software from a PC
- 3 Serial lead to USB port converter.
 - Used where a PC does not have a serial port
- 4 Connector cable for REA (white coloured connector sleeve)
- 5 Connector cable for SREA (black coloured connector sleeve)



Garrett HandyCAN 3 Tester

Before using the tester

1. Open the top cover of the tester. The cover is spring loaded to protect the switch and connections. It may be stiff to operate when new.

Follow this procedure:

Hold the tester with the back facing you.

Apply strong pressure with two thumbs in the positions shown, whilst using two fingers to open the cover



**Back of tester,
showing Serial
Number label**

Lift with fingers whilst applying.....



.....strong pressure against the hinge with thumbs



Lifting the top cover exposes the connections

Garrett HandyCAN 3 Tester

Before using the tester

2. The top panel has 4 connector sockets and 1 switch

- 1 Not used on HandyCAN 3
- 2 REA or SREA connector lead socket (note slot for locating lug)
- 3 On/Off switch
- 4 Battery charger connector socket (note slot for locating lug)
- 5 Not used on HandyCAN 3



Garrett HandyCAN 3 Tester

Before using the tester

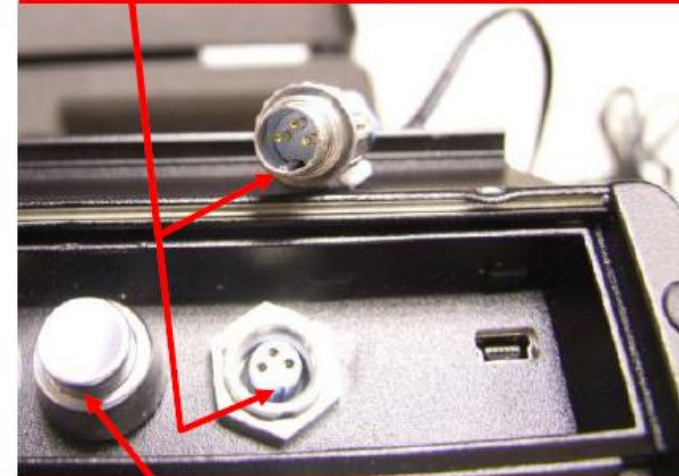
3. Fully charge the battery (if possible overnight) before first use.

Tip: Keep tester connected to the charger when not in use. The intelligent charger keep the batteries in ready to use condition by 'trickle charging'

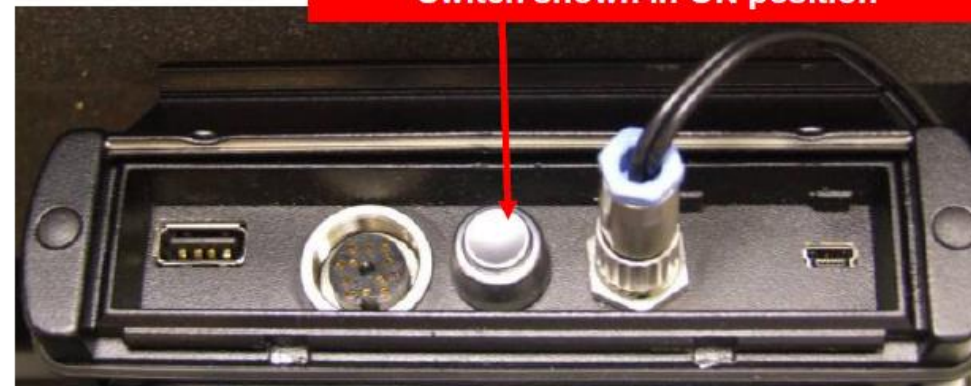
Note: The tester must be switched off during trickle charging

1. Note: The connector and socket have a locating lug which must be lined up.
2. Once lined up, carefully push down on the connector until it stops, then turn the locking sleeve clockwise until the plug is locked in position. Do not overtighten, only light finger pressure is needed.
3. Connect the charger to the mains electricity supply (For EMEA, this should be nominal 230V AC 50-60Hz).

Connector and socket have locating lug and recess to prevent incorrect fitting



Switch shown in OFF position
Switch shown in ON position

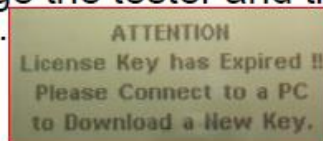


Garrett HandyCAN 3 Tester

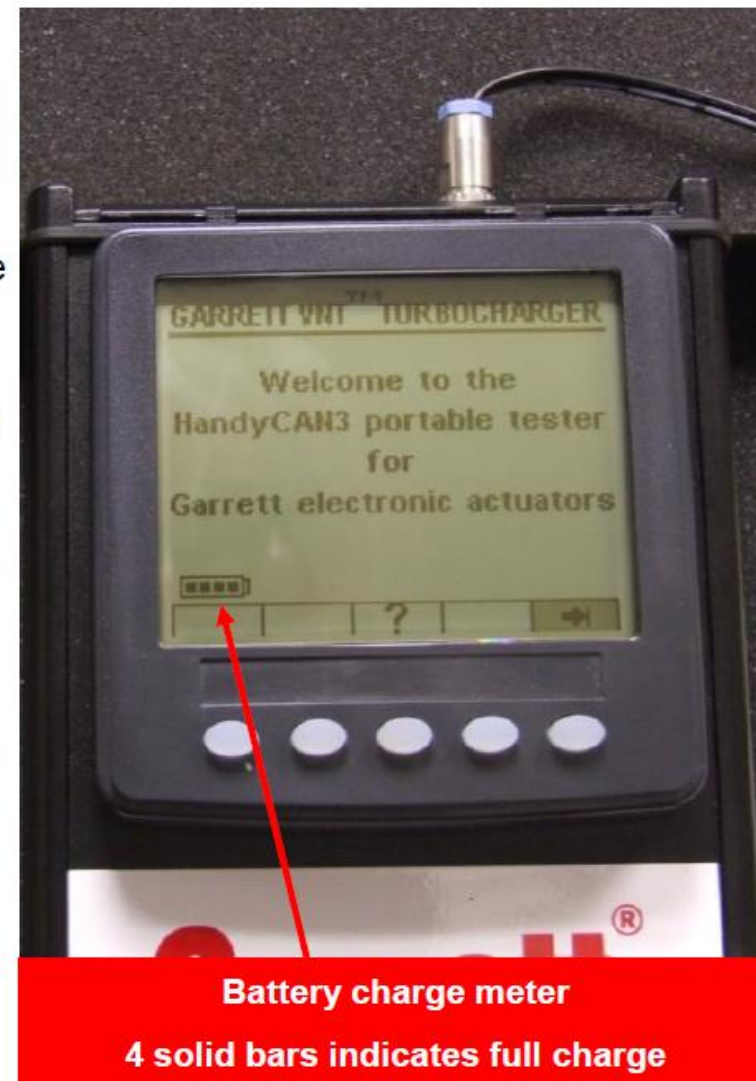
Before using the tester

4. Confirm that charging is taking place:
 1. Switch the tester on (press once).
 2. After the initial opening screen, you will see the welcome screen*
 3. Check the battery meter in the bottom left hand corner. The display should be moving along the bars from left to right, to show that charging is taking place.
 4. Once confirmed SWITCH OFF THE TESTER (press once) whilst it continues to charge.
 5. Periodically check the state of charge by switching on and off as above.
 6. When fully charged the screen shows 4 solid bars.
 7. You may now use the tester.

* Note: If at this point, a message appears regarding Licence Key Expiry please firstly charge the tester and then follow the instructions on pages 36 – 44.



ATTENTION
License Key has Expired !!
Please Connect to a PC
to Download a New Key.



The tester must be switched off during charging

Garrett HandyCAN 3 Tester

To start using the tester

5. Select the correct lead for the actuator
 1. If you are unsure of which type of actuator (REA or SREA) is fitted to the turbo, do not worry! It is not possible to connect the wrong lead. The plugs and sockets have 4 locating lugs and slots, which makes it impossible to connect them in the wrong direction. See notes in General Information at end of instructions.

Note: Bulletin Tech049 shows the different ways to identify the correct connectors:

By the part number shown on the actuator cap (if visible)

By the colour of the connector (may not work for all vehicles)

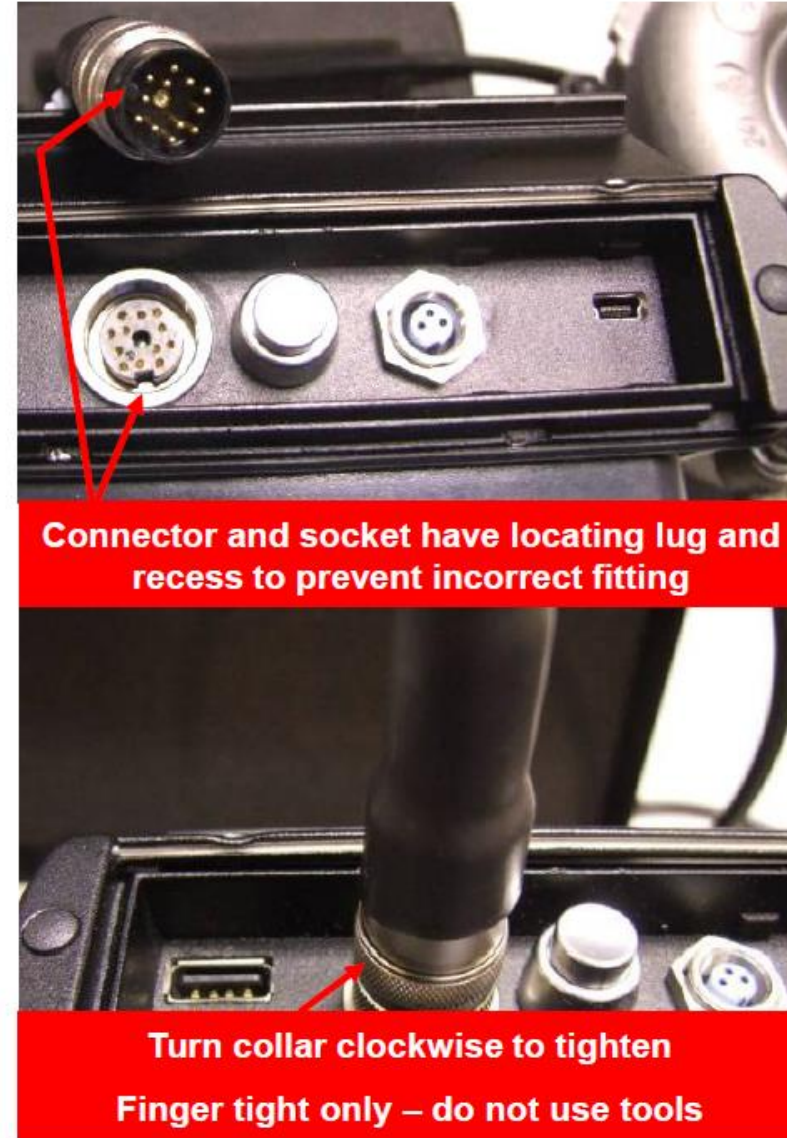
By the position of the locating lugs for the connector



Garrett HandyCAN 3 Tester

To start using the tester

6. Connect the plug on the end of the actuator connecting lead into the socket on the top panel of the tester.
 1. Be careful to ensure that the locating lug is correctly located, before tightening the screw collar.
 2. Screw collar must only be tightened by fingers



Garrett HandyCAN 3 Tester

To start using the tester

7. Connect the test lead to the electronic actuator:
 1. If the turbo is on the vehicle, disconnect the vehicle wiring loom plug from the actuator. Note: the plug may have locktabs which need to be squeezed in to allow removal. These are removed from the HandyCAN 3 Tester plugs for ease of connection.
 2. Ensure that the electrical connections in the connector block on the electronic actuator are not damaged and/or dirty.
 3. Take the connector plug and carefully insert it into the socket on the cap of the actuator. It should fit easily; **DO NOT FORCE THE PLUG**



Garrett HandyCAN 3 Tester

Using the tester

8. Switch the tester on (press once).
9. After the initial opening screen, you will see the welcome screen shown right.
10. Check the battery meter in the bottom left hand corner. The display should show at least 3 bars before starting testing.
11. Press the white button below the arrow symbol \rightarrow to move to the next screen
12. The tester will now ask a series of questions which ensure that the correct tests are completed.
13. The tests are interactive; at each stage you are asked to confirm by using the buttons
 - ✓ (Yes)
 - or
 - × (No)

Accurate inputs are important – please see note in **General Information**



Garrett HandyCAN 3 Tester

Using the tester

14. The testing process:

1. The tester asks you if the turbo is on the vehicle

✓ Yes or × No

1. If ✓ (the turbo *is* on the vehicle) then you are asked if the vane linkage can be disconnected (this may or may not be possible depending on the access)
2. If × (vanes cannot be disconnected) the tester moves directly to the VANES ON test steps (higher power) and omits the VANES OFF steps which test the actuator alone

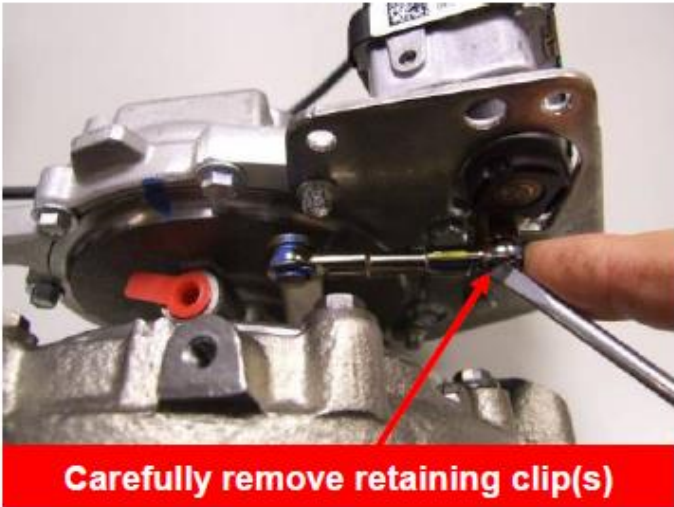


Ensure accurate inputs – if mistake is made, re-start testing

Garrett HandyCAN 3 Tester

Using the tester

14. The testing process continued....:
 1. The tester asks you if the turbo is on the vehicle
 3. If × (the turbo is **off** the vehicle) the screen asks you to disconnect the vane linkage. On some turbos, both retaining clips may need to be removed. Cover with a cloth to prevent loss of clip.
 4. You are then asked to confirm when the vane linkage has been disconnected ✓



Take care with retaining clips which may 'fly' across the room!

Garrett HandyCAN 3 Tester

Using the tester

15. The testing process:

1. At this point, the tester invites you to perform a manual test:
3. Manually move the vanes to assess if they are free – restricted or completely seized in position
4. You are then asked to confirm 'Do they move freely?'

This give you the *option* to manually fail the vane test by pressing **x** if they are obviously seized. This prevents the 'Vaness On' test from taking place.

3. If they are free to move or movement is restricted, you may proceed with the testing by pressing the **✓** button.
4. If you are unsure how to answer, press the **✓** button and the testing will continue.

Optional manual input



Manually move crank assembly to assess condition of vane mechanism



Press white button below ✓ or x to confirm

Garrett HandyCAN 3 Tester

Using the tester

16. The testing process:
 1. A reminder screen asks you to ensure that the lead is connected between the tester and the actuator.
 2. Press ✓ to confirm
 3. The warning screen appears each time the actuator or the actuator & vanes will start to move.



Connection confirmation and safety message

Garrett HandyCAN 3 Tester

Using the tester

17. The testing process:

1. The tester is now communicating with the actuator to determine:
 1. What feedback method it uses: Voltage, PWM or CAN
 2. Initial position. This is for reference only, the actuator will be returned to this position when testing is completed.
 3. Minimum and Maximum values. The example shown is Voltage, but this may also be shown as % PWM signal or Degrees CAN, dependant on application.

Minimum and Maximum values will normally be approximately:

SREA:

Voltage $\leq 0.75V$ and $\geq 4.25V$

PWM $\leq 15\%$ and $\geq 95\%$ (some newer applications may use $\leq 20\%$ and $\geq 80\%$)

REA:

CAN typically $0^\circ - 120^\circ$ or $120^\circ - 0^\circ$

PWM 5% or 10% - 95%

Note: This information is for guidance only and these values may all vary by application. However, the important point is that a Maximum and Minimum value is reached, this confirms that the actuator is working. If the values cannot be found, the actuator will fail the test.



Garrett HandyCAN 3 Tester

Using the tester

18. The testing process:

1. The warning screen appears each time before the actuator or the actuator & vanes start to move.
2. The next step is the Sweep Test.
 1. The actuator moves through 10 complete cycles through the full range of movement.
 2. The screen shows a moving gauge needle to indicate the movement of the actuator output crank.
 3. You may stop the Sweep Test by pressing ✓, although we recommend that the full test should be allowed to complete.



Garrett HandyCAN 3 Tester

Using the tester

18. The testing process:

2. Sweep Test continued.....

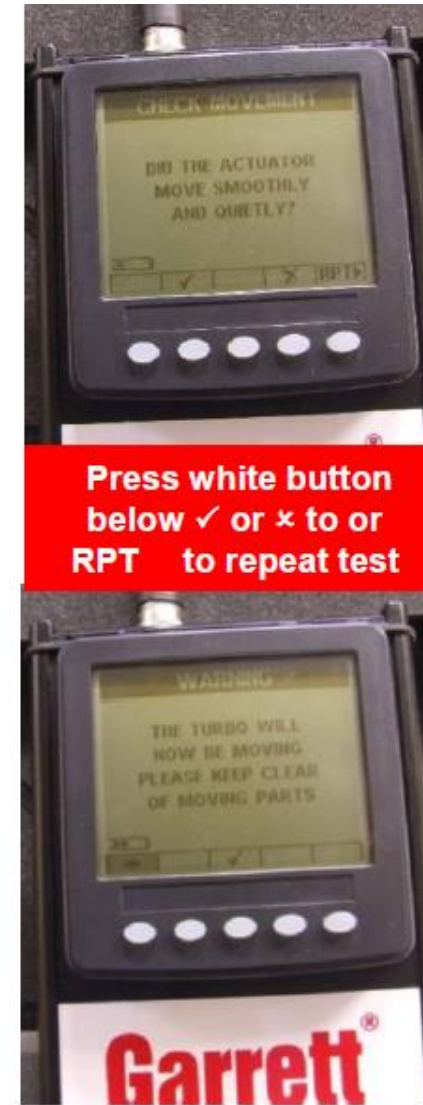
1. Manual input:

1. If the actuator is obviously very noisy or the movement is jerky, you may wish to answer ×, which will finish the testing and 'Actuator Fail' will be recorded
2. If the actuator movement appears smooth and quiet (see **General Information**) then answer ✓ and the tester will proceed to the final part of the actuator test
3. If you are unsure how to answer, press the ✓ button and the testing will continue.
4. **RPT** will repeat the test, a useful feature when testing different types of actuator.

This is also useful if a customer is watching the test as it allows you to demonstrate the actuator working through it's full range.

2. The warning screen appears each time before the actuator or the actuator & vanes start to move. Press ✓ to continue.

Optional manual input



Garrett HandyCAN 3 Tester

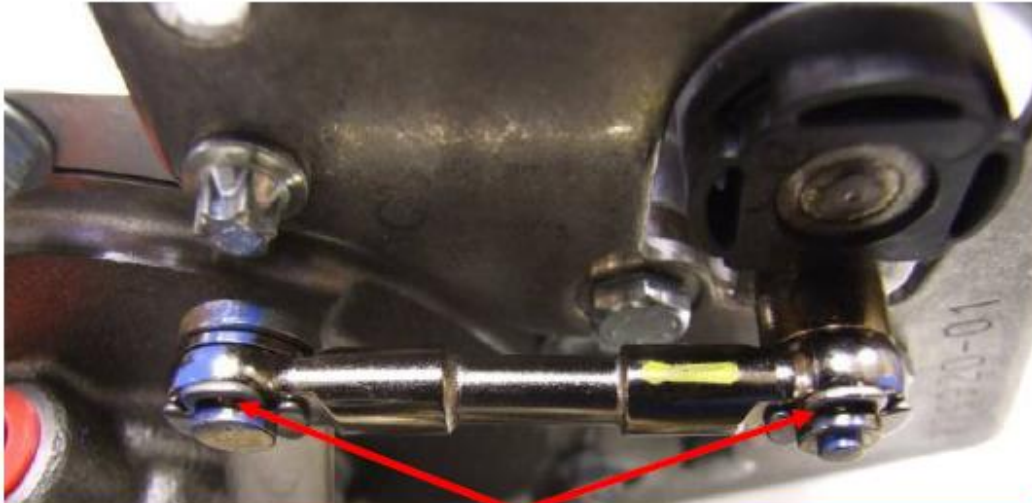
Using the tester

19. The testing process:

1. The Friction Test

1. This test measures the response time of the actuator against the movement.
2. This is the most important part of the test, but takes just a few seconds to complete.

2. When the Friction Test is completed, you are asked to reconnect the vane linkage.



Linkage re-connected. Ensure retaining clips are secure



Garrett HandyCAN 3 Tester

Using the tester

20. The testing process:

1. The 'Vanes On' Test repeats all of the stages from 17.1. but now with higher power to allow for the normal friction within the vane operating mechanism:

Detecting actuator range with vanes connected (expect a smaller overall range than with Vanes Off).

Sweep test

Check operation of positional feedback device

Friction test



Press white button below ✓ to continue testing

Smaller movement range with Vanes On

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Garrett HandyCAN 3 Tester

Using the tester

21. Test results:

1. Some typical examples of test results are shown.
2. Test Step and Fail Code are **not vehicle or actuator error codes**, but indicate where within the HandyCAN 3 test process a failure occurred.



Pass/Pass



**On vehicle, so unable to disconnect vanes.
'Vanes-On' test only possible.
'Vanes-On' test fail. Turbo needs to be removed
to investigate reason for vane fail.**



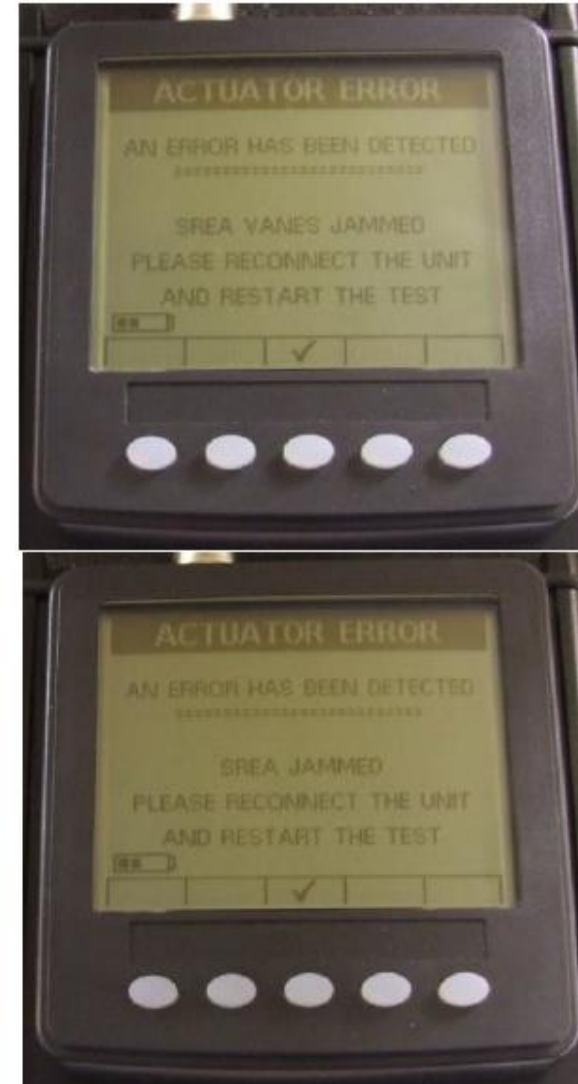
**Off vehicle. 'Vanes-Off' test fail.
'Vanes-On' test unknown due to actuator fail.
If within Warranty period, turbo should be
returned for analysis.**

Garrett HandyCAN 3 Tester

Using the tester

21. Test results:

3. In the case of actuator failure or vane failure, the screen instructs you to reconnect the unit and restart the test to verify the results. This is optional.
 1. In some cases of restricted vane movement, this may 'free off' the vanes during the sweep test.

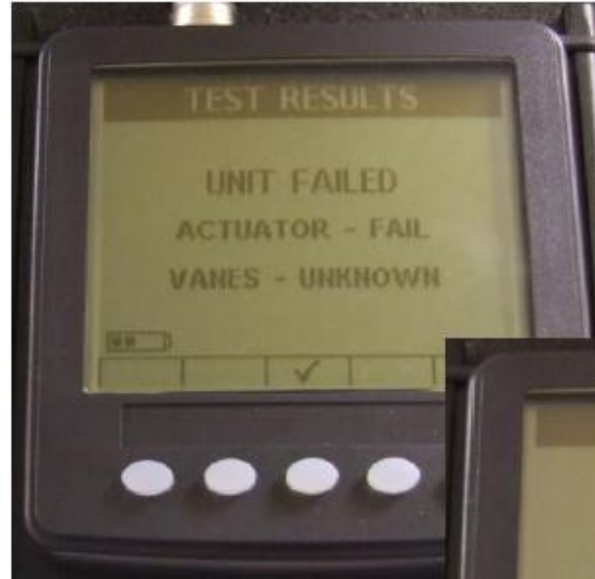
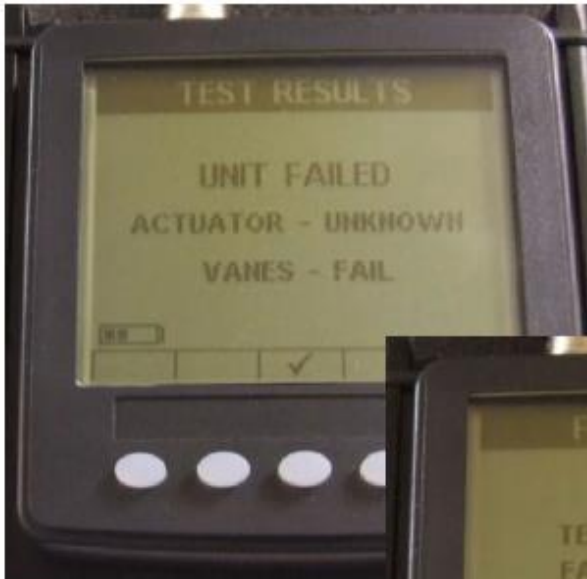


Garrett HandyCAN 3 Tester

Using the tester

21. Test results:

4. In the case of an actuator test failing during the warranty period, record the data from the Test Results and Fail Report screens to accompany a Warranty Claim.



Garrett HandyCAN 3 Tester

Updating the Firmware on the tester

1. From the CD ROM that came with your HandyCAN 3, run the “Flash Utility” and save it onto your PC desktop (or other convenient file location)



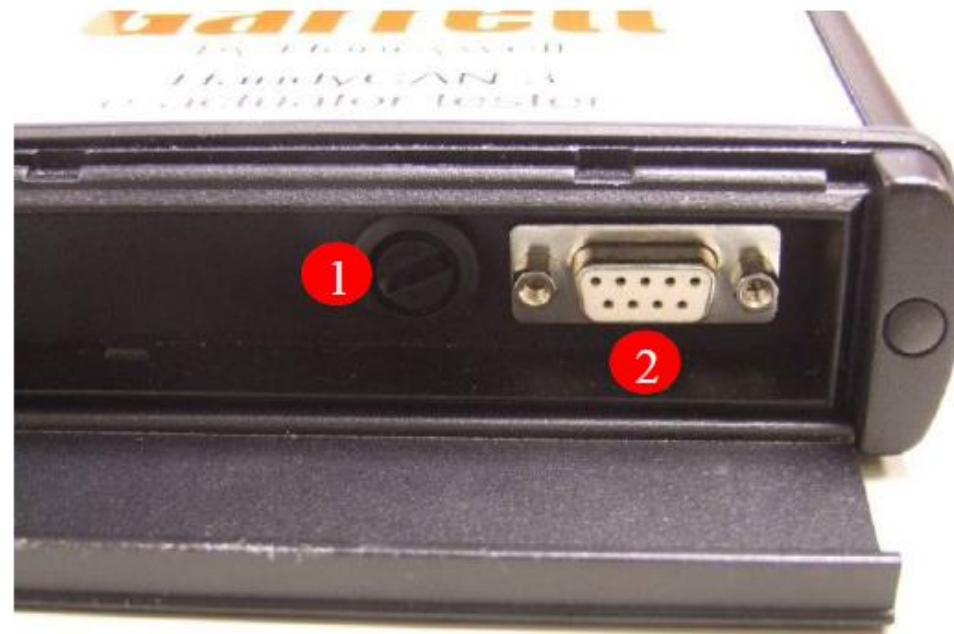
2. Ensure that the latest version of the HandyCAN 3 software is saved onto your desktop (or other convenient file location)



Garrett HandyCAN 3 Tester

Updating the Firmware on the tester

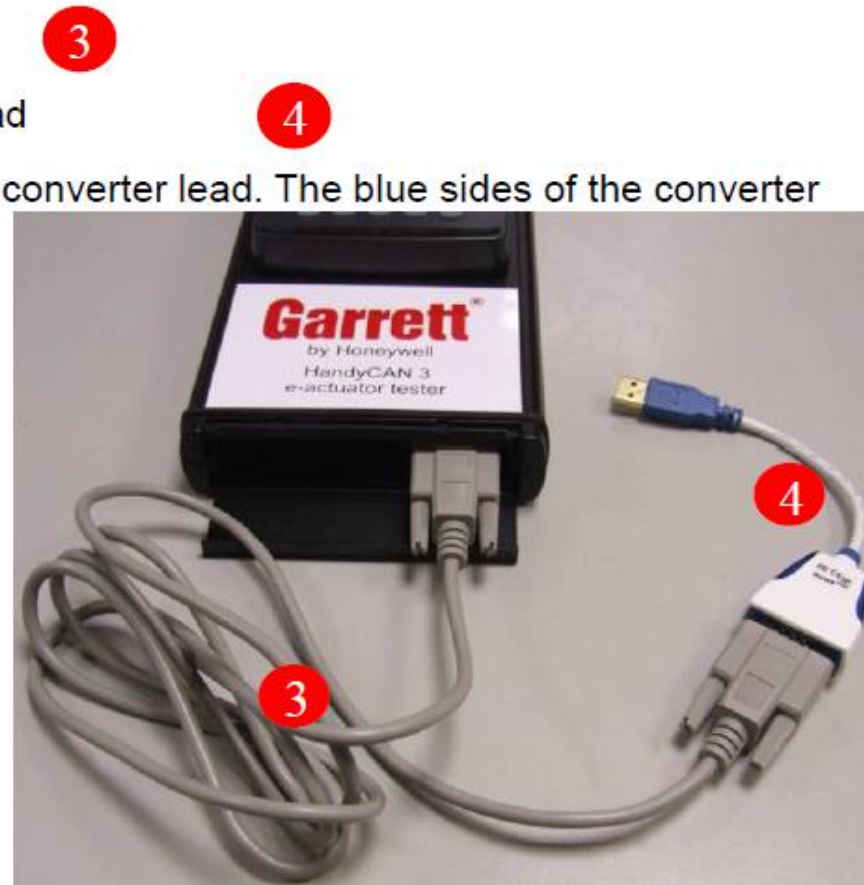
3. Open the bottom panel cover of the HandyCAN 3
4. The bottom panel has 1 connector socket and 1 fuse holder
 - 1 Main fuse
 - 2 Serial port for communication with PC



Garrett HandyCAN 3 Tester

Updating the Firmware on the tester

5. Connect the Serial Lead to Serial Port on bottom panel of HandyCAN 3
6. Switch on the HandyCAN 3
7. Connect the lead to your PC:
 1. If your PC has a Serial Port, use the Serial Lead
 2. If your PC has a USB Port use the Serial/USB converter lead. The blue sides of the converter will flash to confirm that it is connected



Garrett HandyCAN 3 Tester

Updating the Firmware on the tester

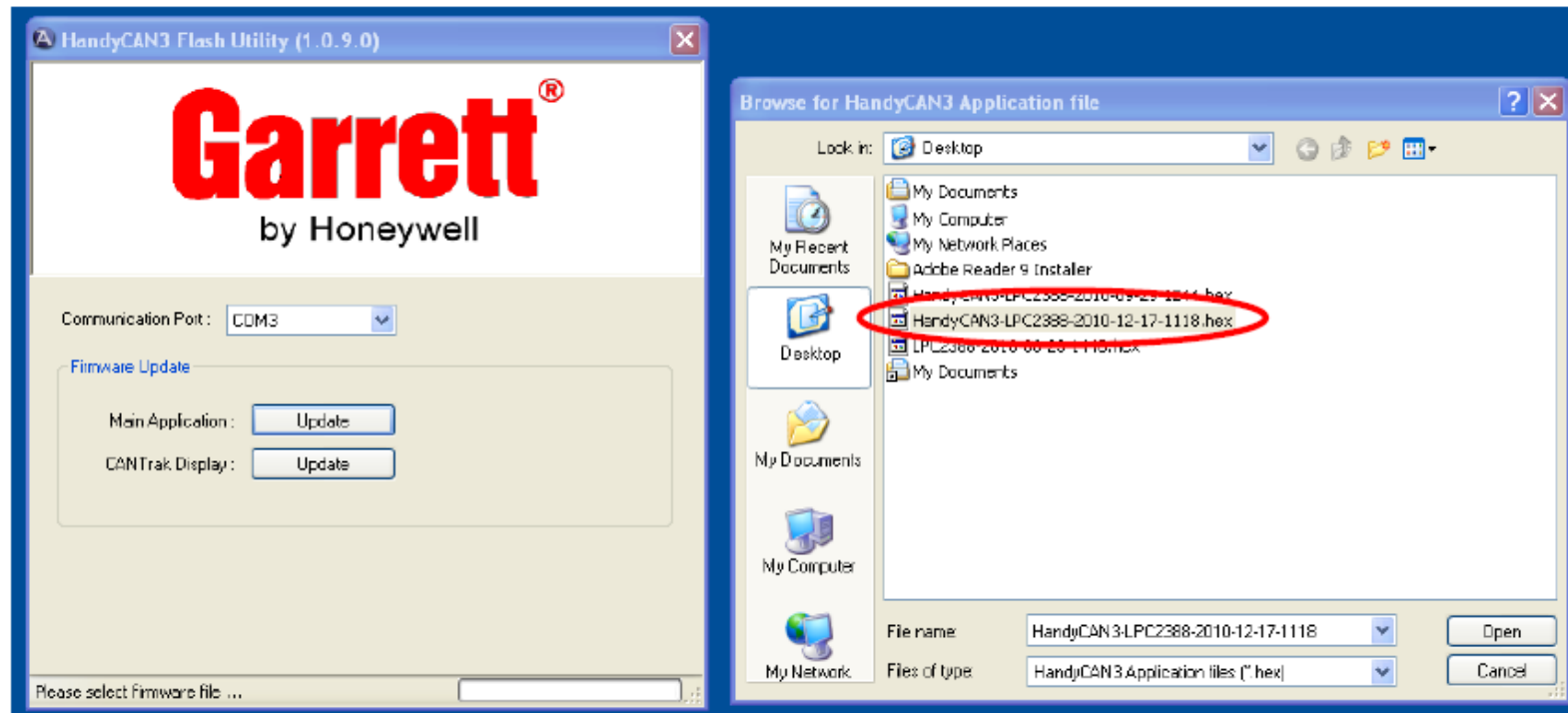
8. With all connections made, double mouse click on the Flash Utility to run the programme. You should then see the screen shown below
9. The e-mail sent by Honeywell which includes the Firmware update will tell you whether it is a “Main Application” update or a “CANTrak Display” update
10. Single mouse click on the correct “Update” button



Garrett HandyCAN 3 Tester

Updating the Firmware on the tester

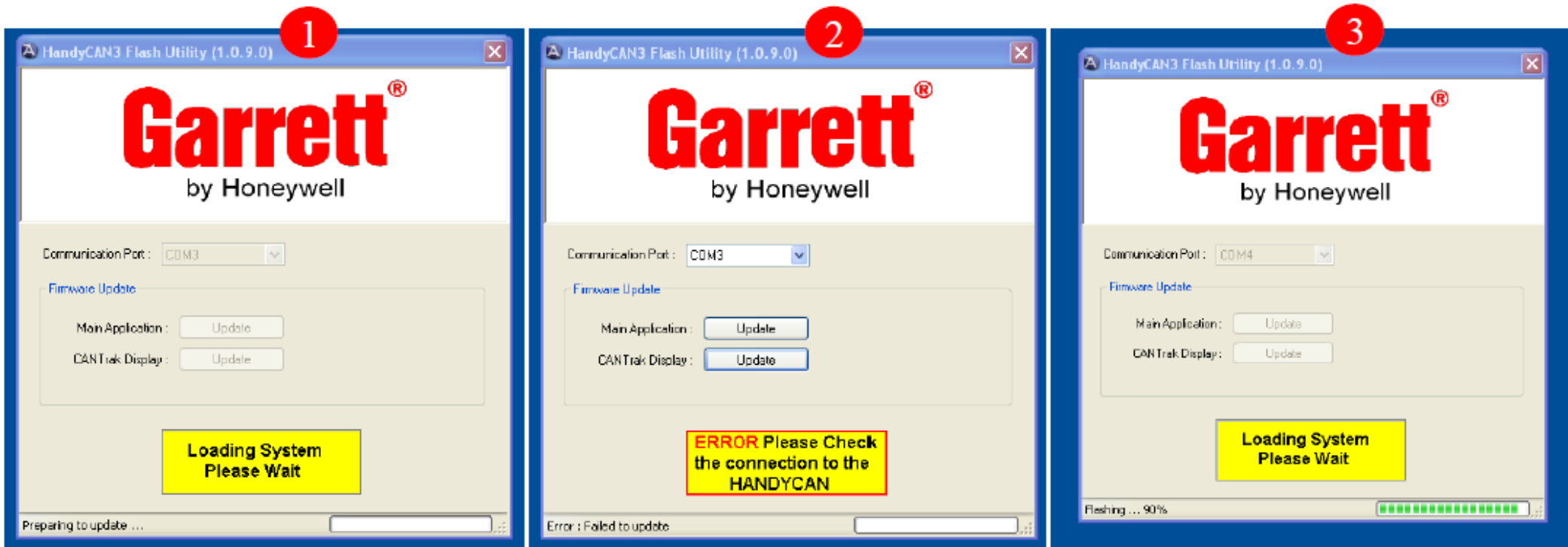
11. A Browse screen should now appear to allow you to browse your files to find and select the correct Firmware update file
12. In this example the highlighted file will be used
13. Select the file by a single mouse click and then click “Open”



Garrett HandyCAN 3 Tester

Updating the Firmware on the tester

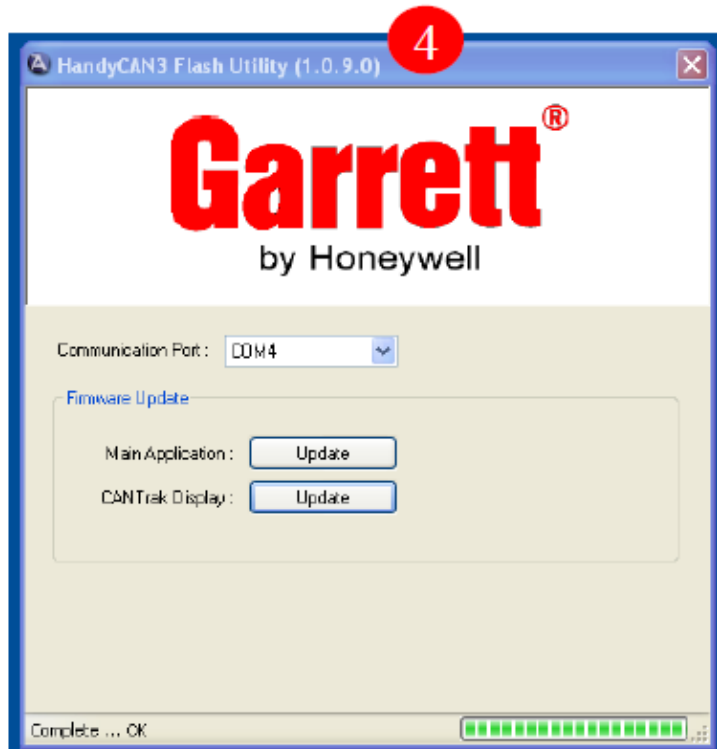
14. Screen **1** shows that the update is starting
15. If screen **2** appears, this shows an error in communication. If this happens, firstly change to another Communication Port (in this example “COM4”) and click “Update” again.
16. Screen 3 confirms that the HandyCAN 3 system is being loaded and at the bottom of the screen tracks progress. The update should take less than 1 minute.



Garrett HandyCAN 3 Tester

Updating the Firmware on the tester

17. Screen **4** shows confirmation of the update in the bottom left corner “Complete....OK”



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Updating the Firmware on the tester

18. Finally, confirm that the Firmware has loaded correctly:
19. From the “Welcome” screen press the button below “?”, then press the button below “→”
20. The bottom line confirms the latest Firmware version is loaded
21. Disconnect the Serial Lead/USB connection from your PC and HandyCAN 3
22. Your update has been successful and you can continue to use the HandyCAN 3 as normal.



Garrett HandyCAN 3 Tester

Security Feature – Licence Key

- The HandyCAN 3 incorporates a SECURITY FEATURE designed to safeguard your property. If the HandyCAN 3 is stolen or mislaid and an unauthorised person attempts to use it, the tester will cease to function after a pre-set period.
- The HandyCAN 3 has a built in timer to allow you to use it for up to 3 months and then after that date, follow a simple procedure to re-licence it. The process assures minimum inconvenience for you, the authorised user, but if an unauthorised person attempts to re-licence your units, the HandyCAN 3 will lock down and prevent use.

This ensures that your HandyCAN 3 will be useless to a thief!

- To re-licence your HandyCAN 3, please use the process on the following pages

3 months license key feature can no longer be renewed

To remove the 3 months license key feature please log in to:

<https://www.garrettmotion.com/knowledge-center-category/turbo-replacement/handycan3/>

and download the latest firmware to update your HandyCAN3 device as explained in January 2023 Tech Bulletin 01 “HandyCAN3 Portable Tester firmware update for 3 months license cancellation”

Garrett HandyCAN 3 Tester

Security Feature, Updating Licence Key

1. 7 days before your Security Feature licence expires, a message will be displayed on the HandyCAN 3 screen pre-warning that your Licence Key is about to expire
2. After this 7 day period or if the licence has already expired, you will see the following message displayed on the HandyCAN 3 screen and you must then download a New Key before using the tester:



3 months license key feature can no longer be renewed

Garrett HandyCAN 3 Tester

Security Feature, Updating Licence Key

3. Switch on the HandyCAN 3
4. From the "Welcome" screen press the button below "?" then press the button below "→"
5. The display then shows the Version and UID.
6. Make a note of the 4 characters as shown below; in this example it is A8CD (ignore the zeros)
7. Switch HandyCAN 3 off

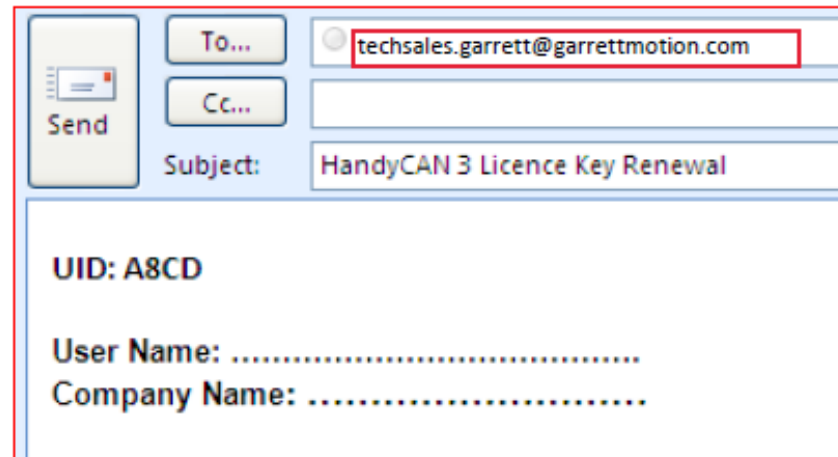


3 months license key feature can no longer be renewed

Garrett HandyCAN 3 Tester

Security Feature, Updating Licence Key

8. Send an email as below to `techsales.garrett@garrettmotion.com` with Subject “HandyCAN 3 Licence Renewal”
 - Please be sure to include the UID, User Name and Company Name:



The screenshot shows an email composition window with the following details:

- To:** techsales.garrett@garrettmotion.com
- Cc:** (empty)
- Subject:** HandyCAN 3 Licence Key Renewal
- Body:**
UID: A8CD

User Name:
Company Name:

9. We will then check against our records that the email and UID is from a valid user and return the Licence Key to you by email
10. When you receive your licence key, it has a file extension “.hcl”. Save this file onto your Desktop or another convenient location on your PC.
11. Follow the next stages in EXACTLY THE ORDER SHOWN. Failure to do this may prevent your HandyCAN 3 from working correctly.

3 months license key feature can no longer be renewed

Garrett HandyCAN 3 Tester

Security Feature, Updating Licence Key

Ensure that your HandyCAN 3 batteries are fully charged before starting the re-licence process

12. Connect the lead to your PC – but **NOT** into HandyCAN 3:
 1. If your PC has a Serial Port, use the Serial Lead
 2. If your PC has a USB Port use the Serial/USB converter lead. The blue sides of the converter will flash to confirm that it is connected.
13. Switch on your HandyCAN 3 - but do **NOT** connect it yet!
14. On your PC start the “HandyCAN 3 Flash Utility”



Then you will see this:



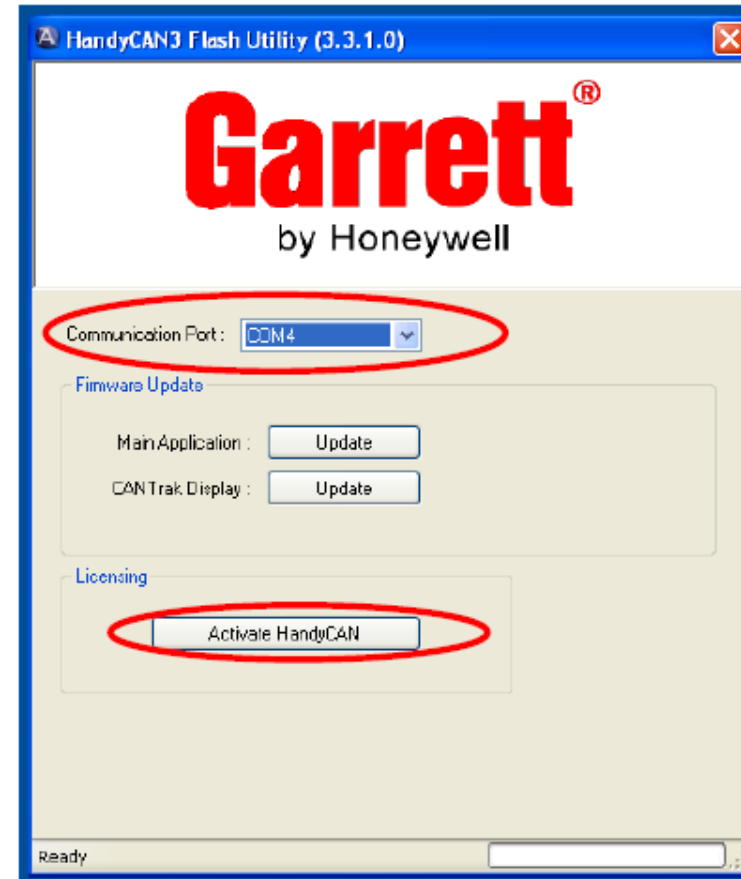
(If the Flash Utility is not yet saved onto your PC, please download it from the CD ROM which came with your HandyCAN 3. See instructions on Page 27 of these instructions)

3 months license key feature can no longer be renewed

Garrett HandyCAN 3 Tester

Security Feature, Updating Licence Key

15. Select the correct Communication Port (where your USB cable or serial cable is connected). In this example it is "COM4" but this may be different on your PC.
16. Now Connect the Serial Lead to Serial Port on bottom panel of HandyCAN 3
17. Select "Activate HandyCAN" with a single mouse click

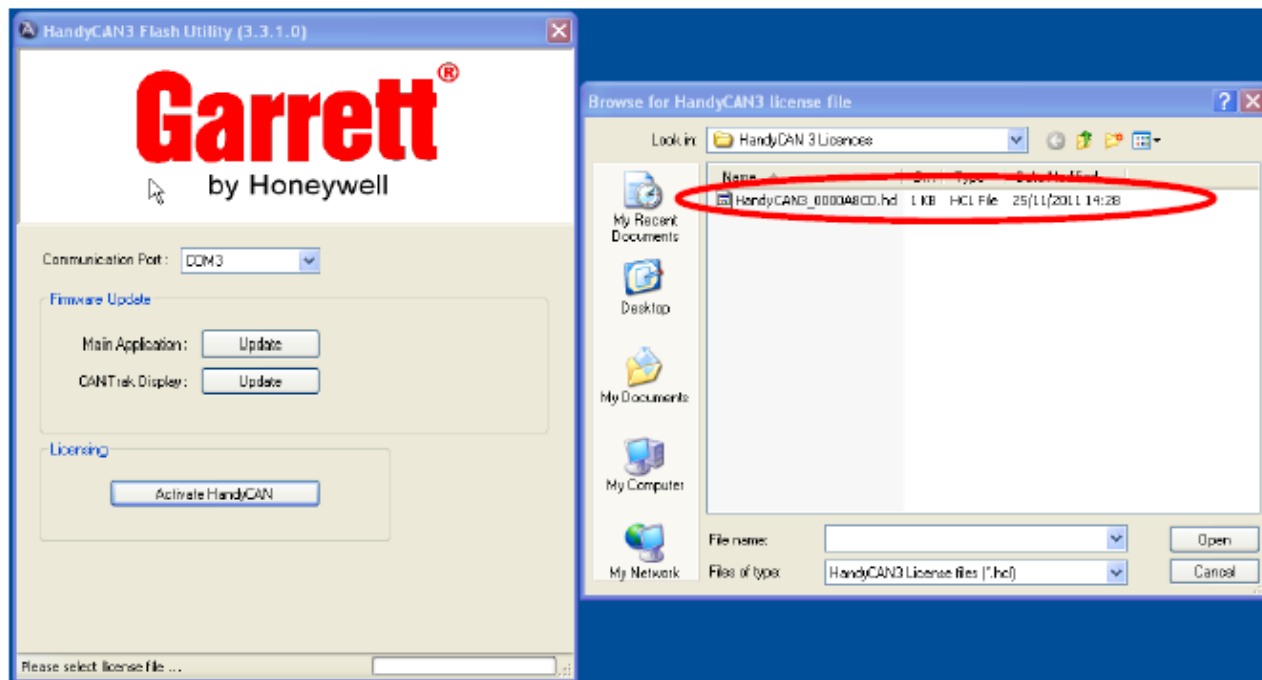


3 months license key feature can no longer be renewed

Garrett HandyCAN 3 Tester

Security Feature, Updating Licence Key

18. A Browse screen should now appear to allow you to search your files to find and select the correct Licence file. This includes your UID number.
19. In this example the highlighted file will be used
20. Select the file by a single mouse click and then click “Open”



Tips: when browsing for the correct file, ensure that you display the date and time of files to ensure the correct file is chosen. Deleting old licence files from your PC helps to avoid errors.

3 months license key feature can no longer be renewed

Garrett HandyCAN 3 Tester

Security Feature, Updating Licence Key

21. The Flash Utility shows that the new licence is activating and then confirms when it has Activated Successfully
22. Disconnect the serial cable from the bottom panel of the HandyCAN 3 and then from the PC



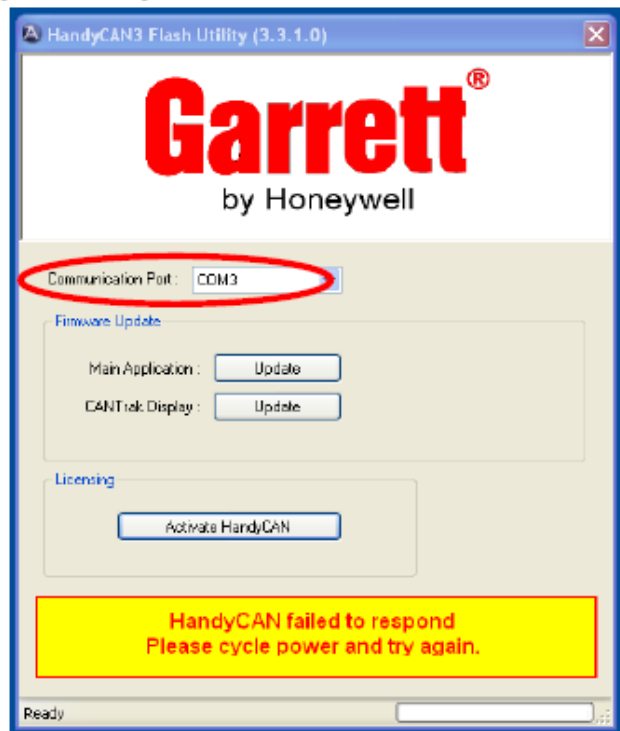
Your HandyCAN 3 is now ready for another 3 months of use

3 months license key feature can no longer be renewed

Garrett HandyCAN 3 Tester

Security Feature, Updating Licence Key - Problems

- 23. If the activation fails for any reason you will see error screens. In the example to the left, the wrong communication port was selected
- 24. In the example to the right, the wrong licence key had been selected. Delete old, out of date licence keys from your PC



In case of errors, turn off HandyCAN 3, disconnect all cable connectors and start the Update Licence Key process again from Point 11.

3 months license key feature can no longer be renewed

Garrett HandyCAN 3 Tester

General Information

1. If the connector on top of the actuator is damaged, the water seal is destroyed and water will almost certainly find its way into the actuator and damage the electronics.
 1. As the actuator internal temperature increases and decreases during normal engine operation, any moisture within the wiring loom/connector or within the broken connector will be drawn in to the actuator and may cause intermittent or total failure.
 2. Turbos which have been used on an engine and are found to have this kind of damage may fail the actuator test on HandyCAN 3 if the electronics are damaged. **However, any warranty claim may be rejected unless a material or manufacturing defect is found.**
 3. A brand new turbocharger with damaged connector should be treated as a “Quality Return” and not a Warranty.



Garrett HandyCAN 3 Tester

General Information

2. Warning regarding correct user inputs:

1. During testing, if you make a mistake in the inputs, you should switch the power off and start the test again.

Example:

If you have confirmed that the vanes are connected (✓).....**but they are actually disconnected**, the tester increases the power to the actuator and it may overshoot and lock the gears at maximum or minimum travel.

2. A strategy is built in to the HandyCAN 3 to help overcome this, however the safest way is to be careful with your inputs – it is very easy.....just take it slowly!

3. Actuator movement and noise

1. During testing there is an opportunity for manual input to determine if the actuator (and/or vanes) move smoothly and quietly.

1. With experience, this becomes easier to judge:

There are 7 different actuator types and with different gears and motors, they all sound different and move at different speeds.

Garrett HandyCAN 3 Tester

General Information

4. In the case of a Actuator test failure you may record this information to include with the Warranty return
5. In the case of a Vane Mechanism failure there are two options:
 - Diagnose the vane mechanism - refer to MOD 04P VNT™ Vane Sticking
 - Return to Honeywell for damage analysis, but please remember.....it may still be NFF!
6. During testing of HandyCAN 3 it was found that turbos with restricted movement to the vanes, but with a good actuator, the vanes actually freed up during testing.
7. Anti-stick strategies are built in to the HandyCAN 3 which recognise and will correct some instances where an actuator has been driven into the 'hard stop'.
8. Anti-foldback strategies are also built in to HandyCAN 3 to detect and try to correct this condition. Foldback is not an actuator fault.

Garrett

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