RV-C Test Procedures

GUIDE FOR TESTING RV-C DEVICES

November 12, 2025

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1 Scope, Introduction, and Disclaimer

RV-C Test Procedures describes the steps necessary to verify that a Recreational Vehicle Controller Area Network (RV-C) enabled device operates correctly on an RV-C network. The purpose of these procedures is to provide testing guidance to assure that a device designed to operate as a node on an RV-C network would do so correctly. Recreation Vehicle Industry Association, Inc. (RVIA) does not certify devices and these tests and their results do not constitute endorsement by RVIA of any particular device. These tests are presented to allow testing of an RV-C device to determine compatibility of network devices. The manufacturer can use its record of successfully completed procedures to show the device's level of conformance to the RV-C protocol document. This document is published by RVIA to assist in the improvement of RV-C compatibility within the RV industry. The use of this document and its contents is entirely voluntary. Furthermore, *RV-C Test Procedures* is a dynamic document that is updated from time to time. RVIA assumes no responsibility for inaccuracies or omissions. The applicability and suitability for any particular use is the sole responsibility of the user.

2 References

This document references specific sections and statements within the RVIA's RV-C protocol document, available for free from www.rv-c.com. Unless otherwise indicated, the latest version of the RV-C protocol document applies.

3   Definitions & Abbreviations

3.1   Abbreviations

Table 3.1 — Abbreviations

Abbreviation	Meaning
DUT	Device Under Test

3.2   Definitions

See also RV-C Protocol Document Table 3.2a.

Table 3.2 — Definitions

Term	Definition
Empty Network	An RV-C network that includes the DUT and Testing Computer (see below) and no other devices. The RV-C network is physically assembled, configured, and terminated per RV-C specification section 2.1.
Testing Computer	A computer with accompanying CAN adapter hardware as described in Section 4 – Equipment of this document.

4   Equipment

The configuration to be followed when performing the tests found in this document consists of: two nodes, the Testing Computer and the device under test (DUT), with appropriate media and termination, as well as power supplies and DUT loads.

4.1   Testing Computer

A conformance Testing Computer with the following capabilities:

4.1.1   Message Transmission

Must be able to send any specified message.

4.1.2 Message Reception

Must be able to receive all bus messages.

4.1.3 Time Stamp

Must be able to time stamp transmitted and received packets.

4.1.4 Listen-Only State

Must be capable of a listen-only state, wherein no CAN packets are transmitted.

5   Test Instructions

The Tests listed in Section 6 – Conformance Tests of this document may be used to validate an RV-C device's conformance with the RV-C Protocol Document.

5.1   Performing a Test

For each test, the individual or group performing the test (referred to here as the "tester") should take any actions described in the "Instructions" column, and then monitor the DUT (using the Testing Computer as well as direct observation) to determine if the behavior shown in the "Expected Device Behavior" column is followed.

Not all tests may be applicable, and tests do not need to be run in numerical order.

5.2   Determining Passed/Not Passed

When determining whether the DUT displays the behavior in the "Expected Device Behavior" column, the tester should check for each of the "Potential Failures" for the current test. If any of these Failures are observed the test is not passed and "No" is entered in the "Pass? Yes/No" column for that test. Each of the devices' failures should be noted in the "Test Result Comments/ List Failures" column.

Note that other failures may be possible; if the tester observes any additional failures these should be listed in the Comments column as well.

5.3   Convenience Columns

The columns "Device Designed to Pass?" and "Device Requested to Pass?" are provided for convenience and have no specific requirements on usage. For instance...

— **Explaining device features.** The "Device Designed to Pass?" column is an effective way for a designer/developer to communicate their device's intended capabilities. This could be done by putting a check next to each test they intended their device to pass.

— **Requesting desired features**. The "Device Requested to Pass?" column is an effective way for an OEM to communicate which features they desire in a device. This could be done by putting a check next to each test they require a device to pass.

— **Planning a test session.** A technician might put checks in the "Device Requested to Pass?" column next to the specific tests they plan to run.

5.4   Notes

Generally, all devices should pass all Addressing Tests and Network Integrity and Diagnostic Tests.

5.4.1   Static vs. Dynamic Addressing

A device need only comply with the tests related to static or dynamic addressing, but not both.

5.4.2   Queuing Limitations

Some exceptions may be made for out-of-order messages due to queuing limitations of CAN transceiver management systems.

5.4.3   Addressing with EEFFh

Addressing using DGN EEFFh, as in other protocols such as J1939, is allowed by RV-C as long as the RV-C-native EE00h DGN is also supported. Broadcasts of DGN EEFFh or requests for DGN EEFFh should be ignored when determining whether a device passes or fails a test.

5.4.4   Appropriate Fields

When determining whether the DUT passes a given test, the tester shall verify that all messages are broadcast with the fields necessary for the given function and all fields are used as documented in the RV-C layer document.

5.4.5   Correct Timing

When determining whether the DUT passes a given test, the tester shall verify that all messages are broadcast within correct minimum and maximum timing as documented in the RV-C layer document.

5.4.6   Representation of Actual Device Status

In any test wherein a status DGN is required, it is implied that the status reasonably represents the actual status of the device. Only data items specifically given in the test are required.

Due to differences in product designs, the specific interpretation of a data value may vary. The supplier has latitude in defining appropriate values, but they must reasonably conform to the sense of the RV-C document.

 5.4.7 Device Operating Status

In interpreting the test directions, the following terms are used.

"Idle" refers to a test in which the DUT receives no commands during the test and does not change its state. The DUT state may be further categorized as "Off", in which case the DUT is not in a running state and will take no independent action, "Standby", in which case the DUT is not in a running state but potentially could take action, and "Running", in which case the unit is in a running state and potentially could take action.

"During device operation" refers to tests in which a change of state is part of the test, either due to a RV-C command or a change in conditions. The test should indicate the initial state and the relevant triggers.

6   Conformance Tests

Device Information (Make, Model, etc.)

6.1   Addressing Tests

6.1.1   Addressing Tests Page 1 of 3

Test	Test Name	Relevant RV-C Protocol Document Section(s)	Instructions	Expected Device Behavior	Potential Failures	Device Designed to Pass?	Device Requested to Pass?	Date Tested	Pass? Yes/No	Comments/List Failures
A-10 Oct. 2025	Static Addressing Bootup	3.3, 7.2	Power device up on an empty network (see DEFINITIONS).	Broadcasts ADDRESS_CLAIM.	1. Arbitrary Address Capable bit is not 0. 2. Claimed address is not device type's assigned DSA. 3. Any other message precedes the claim. 4. DGN is not EE00h (see note on addressing with EEFFh). 5. More than one address is claimed. 6. Manufacturer ID field does not match manufacturer. 7. Less than 250ms elapses after claim before further messages are broadcast. Other failures (list in comments)					
A-20 Oct. 2025	Static Addressing Conflict (Low Priority)	3.3, 7.2	During device operation, transmit (using Testing Computer) ADDRESS_CLAIM for the same SA claimed by the DUT, but with a **lower** priority (see RV-C Layer Document section 3.3.3).	Broadcasts ADDRESS_CLAIM.	1. All Potential Failures from "Static Addressing Bootup". 2. The DUT changes SA (yields its address). 3. Any other message is broadcast before responding to the conflicting claim (see note on "Queuing Limitations"). 4. More than 250ms elapses between the contesting claim and the DUT's response. 5. ADDRESS_CLAIM message does not match previous broadcasts. Other failures (list in comments)					
A-30 Oct. 2025	Static Addressing Conflict (High Priority)	3.3, 7.2	During device operation transmit ADDRESS_CLAIM for the same SA claimed by the DUT, but with a **higher** priority (see RV-C Layer Document section 3.3.3).	Broadcasts ADDRESS_CLAIM.	1. All Potential Failures from "Static Addressing Conflict (Low Priority)". Other failures (list in comments)					
A-40 Oct. 2025	Dynamic Addressing Bootup	3.3, 7.2	Power device up on an empty network (see DEFINITIONS).	Broadcasts targeted request for ADDRESS_CLAIM.	1. The request does not use SA FEh 2. The target is an address outside the device's dynamic range. 3. Any other message precedes the request. 4. The message payload is not 8 bytes long. 5. Request is not for DGN EE00h (see note on addressing with DGN EEFFh) 6. A global request for ADDRESS_CLAIM is made (i.e. target SA is FFh). 7. DUT attempts to claim multiple addresses. Other failures (list in comments)					

6.1.2 Addressing Tests Page 2 of 3

Test	Test Name	Relevant RV-C Protocol Document Section(s)	Instructions	Expected Device Behavior	Potential Failures	Device Designed to Pass?	Device Requested to Pass?	Date Tested	Pass? Yes/No	Comments/List Failures
A-**5**0 Oct. 2025	Dynamic Addressing Startup Conflict (High Priority)	3.3, 7.2	Power device up on an empty network. Within 250ms of the initial request for ADDRESS_CLAIM, transmit ADDRESS_CLAIM for the DUT's targeted SA, but with a **higher** priority than the DUT.	Broadcasts a second request for ADDRESS_CLAIM targeting a new address.	1. All Potential Failures from "Dynamic Addressing Bootup". Other failures (list in comments)					
A-**6**0 Oct. 2025	Dynamic Addressing Startup Conflict (Low Priority)	3.3, 7.2	Power device up on an empty network. Within 250ms of the initial request for ADDRESS_CLAIM, transmit ADDRESS_CLAIM for the DUT's targeted SA, but with a **lower** priority than the DUT.	Broadcasts ADDRESS_CLAIM.	1. Arbitrary Address Capable bit is not 1. 2. Any other message precedes the claim. 3. DGN is not EE00h (see note on addressing with EEFFh). 4. The SA is not the address targeted. 5. Manufacturer ID field does not match manufacturer. 6. No ADDRESS_CLAIM is broadcast using DGN EE00h. 7. Less than 250ms elapses after claim before further messages are broadcast. Other failures (list in comments)					
A-**7**0 Oct. 2025	Dynamic Addressing Startup No Conflict	3.3, 7.2	Power device up on an empty network.	Follows behavior in "Dynamic Addressing Bootup", above, then broadcasts ADDRESS_CLAIM.	1. All Potential Failures from "Dynamic Addressing Startup Conflict (Low Priority)" 2. Less than 250ms elapses between the Request for ADDRESS_CLAIM and the ADDRESS_CLAIM. Other failures (list in comments)					
A-**8**0 Oct. 2025	Dynamic Addressing Subsequent Conflict (Low Priority)	3.3, 7.2	During device operation, transmit ADDRESS_CLAIM for the same SA claimed by the DUT, but with a **lower** priority.	Broadcasts ADDRESS_CLAIM.	1. The DUT changes SA (yields its address). 2. More than 250ms elapses between the contesting claim and the DUT's response. 3. Any other message is broadcast before responding to the conflicting claim (see note on "Queuing Limitations"). 4. ADDRESS_CLAIM message does not match previous broadcasts. Other failures (list in comments)					

6.1.3 Addressing Tests Page 3 of 3

Test	Test Name	Relevant RV-C Protocol Document Section(s)	Instructions	Expected Device Behavior	Potential Failures	Device Designed to Pass?	Device Requested to Pass?	Date Tested	Pass? Yes/No	Comments/List Failures
A-**90** Oct. 2025	Dynamic Addressing Subsequent Conflict (High Priority)	3.3, 7.2	During device operation, transmit ADDRESS_CLAIM for the same SA claimed by the DUT, but with a **higher** priority.	Broadcasts a request for ADDRESS_CLAIM targeting a new address, then broadcasts ADDRESS_CLAIM for the new address.	1. All Potential Failures from "Dynamic Addressing Bootup". 2. The targeted address is not acceptable per Layer Document section 3.3.2. 3. Any message other than request for ADDRESS_CLAIM is broadcast until ADDRESS_CLAIM is transmitted. 4. Less than 250ms elapses between the Request for ADDRESS_CLAIM and the ADDRESS_CLAIM. 5. Less than 250ms elapses after claim before further messages are broadcast. Other failures (list in comments)					
A-**100** Oct. 2025	Dynamic Addressing, Preferred Range Full	3.3, 7.2	During device operation, transmit ADDRESS_CLAIM at sufficient priority and time intervals for each SA in the DUT's 'Preferred Dynamic Address Range' such that every address in the DUT's preferred range appears to be taken.	Broadcasts ADDRESS_CLAIM targeted at an SA that is outside the DUT's Preferred Dynamic Address Range.	1. The targeted address is not acceptable per RV-C Specification Section 3.3.2. Other failures (list in comments)					
A-**110** Oct. 2025	Respond to Request for ADDRESS_CLAIM	3.3, 7.2	During device operation, transmit request for ADDRESS_CLAIM targeting the DUT'S SA.	Broadcasts ADDRESS_CLAIM.	1. ADDRESS_CLAIM message does not match previous broadcasts. 2. SA is incorrect. 3. More than 250ms elapses between the Request for ADDRESS_CLAIM and the ADDRESS_CLAIM. Other failures (list in comments)					

6.2   Network Integrity & Diagnostics Tests

6.2.1 Network Integrity & Diagnostics Tests Page 1 of 4

Test	Test Name	Relevant RV-C Layer Document Section(s)	Instructions	Expected Device Behavior	Potential Failures	Device Designed to Pass?	Device Requested to Pass?	Date Tested	Pass? Yes/No	Comments/List Failures
ND-10 Oct. 2025	Global Request for DGN	3.2.4	During device operation, transmit global requests (target FFh) for at least three status DGNs *not* supported by the DUT, and three status DGNs *supported* by the DUT. Leave instance fields as FFh.	Responds to supported DGNs only.	1. Broadcasts an acknowledgement (ACK or NAK) or any other message in response to a non-supported global DGN request. 2. More than 250ms elapses between the request for a supported DGN and the DUT's response. 3. Different DGNs are broadcast than were requested. 4. If multiple instances are supported: Doesn't broadcast DGNs for all applicable instances. Other failures (list in comments)					
ND-20 Oct. 2025	Targeted Request for DGN	3.2.4, 7.5	During device operation, transmit requests targeted at the DUT's SA for at least three status DGNs *not* supported by the DUT, and three status DGNs *supported* by the DUT. Leave instance fields as FFh.	Responds with status messages for supported DGNs and acknowledgements for non-supported DGNs.	1. More than 250ms elapses between the request for a non-supported DGN and the DUT's NAK response. 2. "Acknowledgment code" of NAK is not between 1 and 7. 3. "Source address" or "DGN Acknowledged" fields of NAK do not match request. 4. More than 250ms elapses between the request for a supported DGN and the DUT's response. 5. Different DGNs are broadcast than were requested. 6. If multiple instances are supported: Doesn't broadcast DGNs for all applicable instances. Other failures (list in comments)					
ND-30 Oct. 2025	Request for DGN - Random Target	3.2.4	During device operation, transmit requests targeted at random SA's (not including the SA of the DUT) for at least three status DGNs supported by the DUT.	Does not respond to any request.	1. Broadcasts status DGN or any other message in response to request. Other failures (list in comments)					
ND-40 Oct. 2025	PRODUCT_ID	3.2.8	During device operation, transmit request for PRODUCT_ID targeting the DUT'S SA.	Broadcasts PRODUCT_ID.	1. Data does not include three "*" delimiters. 2. If broadcasting as a multi-packet message: Less than 50ms elapses between subsequent packets. 3. PRODUCT_ID is broadcast on a regular schedule instead of on request only. Other failures (list in comments)					

6.2.2 Network Integrity & Diagnostics Tests Page 2 of 4

Test	Test Name	Relevant RV-C Layer Document Section(s)	Instructions	Expected Device Behavior	Potential Failures	Device Designed to Pass?	Device Requested to Pass?	Date Tested	Pass? Yes/No	Comments/List Failures
ND-**5**0 Oct. 2025	DM_RV	3.2.5	During device operation, with no active faults.	Broadcasts DM_RV for each device type implemented in the node.	1. Does not broadcast on a 5000ms schedule. 2. Red or yellow lamp status is indicated. 3. DSA does not match product type/function. 4. Statically addressed device: DSA is different than SA. 5. Bytes 2-4 are not FFFFFFh. 6. DUT supports multiple device types but does not broadcast DM_RV for each device type supported. 7. If broadcasting multiple DM_RVs - does not stagger broadcasts of DM_RVs throughout 5000ms schedule. Other failures (list in comments)					
ND-**6**0 Oct. 2025	DM_RV with Faults	3.2.5	During device operation, create two or more faults *at the same time* that the DUT is capable of reporting according to the supplier. If multiple instances and/or device types are supported, create two or more faults for each instance of each device type *all at the same time*.	Broadcasts DM_RVs indicating each fault.	1. More than 250ms elapses between the onset of a fault condition and a broadcast of DM_RV indicating the fault. 2. A DM_RV for a "critical" (potential safety or damage) fault is not broadcast on a 100ms schedule. 3. A DM_RV for a non-critical fault is not broadcast on a 1000ms schedule. 4. Neither Red nor Yellow fault status is indicated in any DM_RV broadcast. 5. Multi-instance SPNs: SPN MSB doesn't indicate instance. 6. When broadcasting faults for multiple devices, DSA doesn't accurately indicate which device is in fault mode. 7. Undefined SPN/FMI values are used. 8. Uses DM_RV to share information that should be indicated in a standard message instead (example: AC Point message faults). Other failures (list in comments)					
ND-**7**0 Oct. 2025	DM_RV clearing Faults	3.2.5	During fault condition (see test "DM_RV with Faults" above), remove/clear all fault conditions for each instance and device type implemented.	Broadcasts DM_RVs indicating faults are no longer active.	1. DM_RV with faults continues to be broadcast even after the fault condition has been resolved (exception made for faults that require the "clear faults" command according to the supplier). 2. DM_RV broadcast timing doesn't return to 5 seconds after fault is cleared. 3. Bytes 2-4 continue to show data, including instance, after fault is cleared. 4. Yellow or red lamp status continues to indicate a fault after fault is cleared. Other failures (list in comments)					

6.2.3 Network Integrity & Diagnostics Tests Page 3 of 4

Test	Test Name	Relevant RV-C Layer Document Section(s)	Instructions	Expected Device Behavior	Potential Failures	Device Designed to Pass?	Device Requested to Pass?	Date Tested	Pass? Yes/No	Comments/List Failures
ND-**80** Oct. 2025	Proprietary Messages	3.2.6	Broadcast at least five proprietary messages with random contents targeted at random SAs (not including the SA of the DUT).	Does not respond or change function in any way.	1. Broadcasts a NAK or any other message in response to proprietary messages. Other failures (list in comments)					
ND-**90** Oct. 2025	Sample of Network Traffic	3.1, 3.2.0 3.2.3, 3.2.6	During device operation, sample and review DUT's broadcast messages over at least a 10 second period.	Maintains appropriate message gap, length, byte filling, and CAN header contents during sample period, and uses no prohibited (per section 4.2 of the RV-C protocol document) messages.	1. Doesn't maintain at least a 50ms gap between messages broadcast (except when shorter messages are required to fulfill reporting requirements of supported status DGNs). 2. Any message has a payload not equal to 8 bytes. 3. Bit 25 of the CAN header of any message is not 0. 4. The priority of any message is higher than the value specified in its DGN definition. 5. Any byte/field not defined in the RV-C layer document is not filled with the appropriate "No data" indicator (e.g. FFh). 6. Any prohibited (per section 4.2 of the RV-C protocol document) message is used. 7. Any proprietary DGNs are used. 8. Does not conform to requirements of notes 5.4.4 and 5.4.5 in this document. Other failures (list in comments)					
ND-**100** Oct. 2025	Ignore Source Address	3.2	During device operation, broadcast a command the DUT is capable of accepting according to the supplier; re-broadcast the same command at least four more times using a different SA each time. Repeat with at least one additional command the DUT supports.	Accepts and implements all commands, regardless of SA.	1. Only accepts commands from a specific SA or range. Other failures (list in comments)					
ND-**110** Oct. 2025	Empty Commands	3.2.3.2	During device operation, broadcast a command the DUT is capable of accepting according to the supplier, but with "No Data" values in each data field (except Instance, if applicable). Repeat with at least one additional command supported by the DUT.	Responds with corresponding status message(s) or NAK as indicated in the RV-C Protocol Document.	1. Implements any function supported by the command. 2. More than 250ms elapses between the command broadcast and the DUT's response. Other failures (list in comments)					

6.2.4 Network Integrity & Diagnostics Tests Page 4 of 4

Test	Test Name	Relevant RV-C Layer Document Section(s)	Instructions	Expected Device Behavior	Potential Failures	Device Designed to Pass?	Device Requested to Pass?	Date Tested	Pass? Yes/No	Comments/List Failures
ND-**120** Oct. 2025	Clear Faults	6.2.1	If any fault requires manual "clearing" according to the supplier: During device operation... 1. Create the fault situation until the DUT broadcasts the fault via DM_RV 2. Remove the fault situation 3. Broadcast GENERAL_RESET targeted at the device with the Clear Faults flag set.	Broadcasts an appropriate fault until GENERAL_RESET is received, then broadcasts DM_RV indicating faults are cleared.	1. No fault is broadcast. 2. The fault automatically clears when the fault situation goes away, before GENERAL_RESET is broadcast. 3. A fault persists after GENERAL_RESET is broadcast. 4. More than 250ms elapse between the broadcast of GENERAL_RESET and the DUT's response of DM_RV. Other failures (list in comments)					
ND-**130** Oct. 2025	NAK	3.2.4.4	During device operation, Broadcast a command the DUT is capable of accepting according to the supplier, but with a field set to a mode or value the DUT is not capable of supporting according to the supplier. Repeat with at least five additional fields (in the same command message or a different command supported by the DUT) as such fields are available.	Responds with acknowledgment indicating command will not be executed.	1. No response is broadcast. 2. The corresponding status message (e.g. inverter status in response to inverter command) is broadcast instead of a NAK. 3. More than 250ms elapse between command and DUT response. 4. Acknowledgment code is not 5 or 1 (3 or 4 are also acceptable but not preferred). 5. Acknowledgment is not targeted at SA used in command from Testing Computer. 6. "DGN Acknowledged" does not match command DGN. Other failures (list in comments)					
ND-**140** Oct. 2025	Incorrect Instance	3.2.4.1	For instanced device types only: During device operation, broadcast a command the DUT is capable of accepting according to the supplier, but with an instance different than that of the device. Repeat with 4 additional, random instances. Repeat the above with at least one additional command supported by the DUT, if supported.	Does not respond or acknowledge command.	1. A NAK is broadcast in response. 2. A corresponding status message, or any other message, is broadcast in response. Other failures (list in comments)					
ND-**150** Oct. 2025	Transparency of Control Activity	4.4.1.7	For devices that support a method of control independent of RV-C: Exercise independent controls.	Broadcasts status messages on change consistent with operation.	1. No broadcast of status on change. 2. Does not conform to requirements of notes 5.4.4 and 5.4.5 in this document. Other failures (list in comments)					

6.3 Device-Type-Specific Tests

6.3.1 Water Heater* Tests Page 1 of 4

Test	Test Name	Relevant RV-C Layer Document Section(s)	Instructions	Expected Device Behavior	Potential Failures	Device Designed to Pass?	Device Requested to Pass?	Date Tested	Pass? Yes/No	Comments/List Failures
WH-**10** Oct. 2025	Status While Idle	6.9	While DUT is idle (off – see note 5.4.7) on an empty network, with no active faults.	Broadcasts WATERHEATER_STATUS.	1. More than 5000ms elapses between broadcasts. 2. Less than 500ms elapses between broadcasts. 3. Instance is not between 1 and 250. 4. Operating mode is not 0. 5. Any of the flags in bytes 6 or 7 does not represent device status – see note 5.4.6 of this document. Other failures (list in comments)					
WH-**20** Oct. 2025	Start Command	6.9	While DUT is idle (off – see note 5.4.7), broadcast WATERHEATER_COMMAND for DUT's instance with Operating mode set to a heating mode supported by the device. Repeat for each heating mode supported by DUT.	Broadcasts WATERHEATER_STATUS indicating corresponding heating mode.	1. More than 250ms elapses between broadcast of command and DUT's response with WATERHEATER_STATUS. 2. Operating status remains as 0 (off) and no explanatory NAK and/or diagnostic message is broadcast. 3. Operating status reported indicates DUT is heating but is using a different mode than was commanded. 4. Operating status reported does not represent actual device status – see note 5.4.6 of this document. 5. "Burner status" flag is set during electric-only operation. 6. "AC element status" flag set in combustion-only mode. Other failures (list in comments)					
WH-**30** Oct. 2025	Stop Command	6.9	During device operation (repeat for each supported operating mode) broadcast WATERHEATER_COMMAND for DUT's instance with Operating mode set to 0.	Broadcasts WATERHEATER_STATUS indicating operating mode 0, 'off'.	1. More than 250ms elapses between broadcast of command and DUT's response with WATERHEATER_STATUS. 2. Operating status doesn't change to 0 (off) and no explanatory NAK and/or diagnostic message is broadcast. 3. Operating status reported does not represent actual device status – see note 5.4.6 of this document. Other failures (list in comments)					
WH-**40** Oct. 2025	Water Heater Timer	6.9	Follow instructions from "Start Command" (WH-20), above.	Follows expected behavior from "Start Command" (WH-20), then broadcasts WATERHEATER_TIMER_STATUS with time remaining in "System timer" field.	1. All potential failures from "Start Command" (WH-20). 2. Instance of WATERHEATER_TIMER_STATUS does not match instance of DUT. 3. "System timer" reaches 0, but WATERHEATER_STATUS still indicates "Operating mode" other than 0 (off). Exception: see note 5.4.2. Other failures (list in comments)					

*Water heater tests also apply to the central boiler of hydronic heating systems.

6.3.2 Water Heater Tests Page 2 of 4

Test	Test Name	Relevant RV-C Layer Document Section(s)	Instructions	Expected Device Behavior	Potential Failures	Device Designed to Pass?	Device Requested to Pass?	Date Tested	Pass? Yes/No	Comments/List Failures
WH-**50** Oct. 2025	Set Point Temperature	5.3, 6.9	During device operation (repeat for each supported operating mode), broadcast WATERHEATER_COMMAND for DUT's instance with "Set point temperature" at a valid value in the range supported by the DUT. Repeat for an additional four (4) different temperature settings.	Broadcasts WATERHEATER_STATUS indicating new set point temperature.	1. More than 250ms elapses between command and status. 2. Reported set point temperature does not change and no explanatory NAK and/or diagnostic message is broadcast. 3. Set point temperature reported indicates a different temperature than was commanded (exception: see failure 4). 4. When receiving a set temperature between supported values (e.g. 48.5°C when only 48°C or 49°C are supported), does not parse command as the higher supported value. Other failures (list in comments)					
WH-**60** Oct. 2025	Electric Element Level	6.9	During device operation (repeat for each supported operating mode), broadcast WATERHEATER_COMMAND for DUT's instance with Operating mode set to FFh (no change) and 'Electric Element Level' equal to 1. Repeat for each Electric Element Level up to level 13.	Broadcasts WATERHEATER_STATUS_2 indicating new electric element level after each command.	1. More than 250ms elapses between broadcast of command and DUT's response with WATERHEATER_STATUS_2. 2. More than 5000ms elapses between broadcasts of WATERHEATER_STATUS_2. 3. Reported element level does not match level commanded, and no NAK and/or diagnostic message is broadcast. 4. Reported element level is higher than "Max Electric Element Level" reported. 5. Operating status in WATERHEATER_STATUS changes Other failures (list in comments)					
WH-**70** Oct. 2025	Hot Water Priority	6.9	During device operation (repeat for each supported operating mode), broadcast WATERHEATER_COMMAND_2 for DUT's instance with "Hot Water Priority" set to 0 (domestic water priority); broadcast again with priority set to 1 (heating priority), then once more with priority set to 0 (domestic water priority).	Broadcasts WATERHEATER_STATUS_2 indicating 'Hot Water Priority' after each command.	1. More than 250ms elapses between broadcast of command and DUT's response with WATERHEATER_STATUS_2. 2. More than 5000ms elapses between broadcasts of WATERHEATER_STATUS_2. 3. Reported 'Hot Water Priority' does not match level commanded, and no NAK and/or diagnostic message is broadcast. 4. Operating status reported does not represent actual device status – see note 5.4.6 of this document. Other failures (list in comments)					
WH-**80** Oct. 2025	Hot Water Priority Timer	6.9	Follow instructions from "Hot Water Priority" (WH-70), above.	Follows expected behavior from "Hot Water Priority" (WH-70), then broadcasts WATERHEATER_TIMER_STATUS with time remaining in "Domestic Water timer" field.	1. All potential failures from "Hot Water Priority" (WH-70). 2. Instance of WATERHEATER_TIMER_STATUS does not match instance of DUT. 3. "Domestic Water timer" reaches 0, but WATERHEATER_STATUS_2 still indicates "Hot Water Priority" of 0 (domestic water). Exception: see note 5.4.2. Other failures (list in comments)					

6.3.3 Water Heater Tests Page 3 of 4

Test	Test Name	Relevant RV-C Layer Document Section(s)	Instructions	Expected Device Behavior	Potential Failures	Device Designed to Pass?	Device Requested to Pass?	Date Tested	Pass? Yes/No	Comments/List Failures
WH-**90** Oct. 2025	Engine Preheat	6.9	During device operation (repeat for each supported operating mode), broadcast WATERHEATER_COMMAND_2 with "Engine Preheat" set to 1 (On); broadcast again with preheat set to 0 (Off), then once more with preheat set to 1 (On).	Broadcasts WATERHEATER_STATUS_2 indicating 'Engine Preheat' status after each command.	1. More than 250ms elapses between broadcast of command and DUT's response with WATERHEATER_STATUS_2. 2. More than 5000ms elapses between broadcasts of WATERHEATER_STATUS_2. 3. Reported preheat status does not match command, and no NAK and/or diagnostic message is broadcast. 4. Operating status reported does not represent actual device status – see note 5.4.6 of this document. Other failures (list in comments)					
WH-**100** Oct. 2025	Specific Component Commands	6.9	During device operation (repeat for each supported operating mode), broadcast WATERHEATER_COMMAND_2 with "Command" (byte 2) set to a command supported by DUT. Repeat for each command/value in this field supported by DUT.	Broadcasts WATERHEATER_STATUS_2 with bytes 3 and 4 indicating corresponding Burner, Electric Low, and Electric High statuses after each command.	1. More than 250ms elapses between broadcast of command and DUT's response with WATERHEATER_STATUS_2. 2. More than 5000ms elapses between broadcasts of WATERHEATER_STATUS_2. 3. Reported burner/element statuses do not match command, and no NAK and/or diagnostic message is broadcast. 4. (If broadcast by DUT) WATERHEATER_STATUS "Operating mode", "Burner status", or "AC element status" fields do not match WATERHEATER_STATUS_2. 5. Operating status reported does not represent actual device status – see note 5.4.6 of this document. Other failures (list in comments)					
WH-**110** Oct. 2025	Circulation Pump Status	6.9	While DUT is on an empty network with no faults active. Repeat for each supported operating mode (including 'OFF' as well as all supported heating modes).	Broadcasts CIRCULATION_PUMP_STATUS for each supported circulation pump instance.	1. More than 5000ms elapses between broadcasts. 2. Less than 500ms elapses between broadcasts. 3. Instance is not between 1 and 250. 4. Operating mode is not 0 or 1. 5. Any of the flags in byte 2 are set. Other failures (list in comments)					
WH-**120** Oct. 2025	Circulation Pump Test	6.9	While DUT is idle (off – see note 5.4.7), broadcast CIRCULATION_PUMP_COMMAND for desired pump's instance with "Output Mode" set to 5, "Test (Forced On)". Repeat for each supported circulation pump instance.	Broadcasts CIRCULATION_PUMP_STATUS indicating output status as "Test (Forced On)."	1. More than 250ms elapses between broadcast of command and DUT's reply with status broadcast. 2. Reported pump output status does not match command, and no NAK and/or diagnostic message is broadcast. 3. Operating status reported does not represent actual device status – see note 5.4.6 of this document. Other failures (list in comments)					

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Test	Test Name	Relevant RV-C Layer Document Section(s)	Instructions	Expected Device Behavior	Potential Failures	Device Designed to Pass?	Device Requested to Pass?	Date Tested	Pass? Yes/No	Comments/List Failures
WH-**130** Oct. 2025	Circulation Pump Timer	6.9	Follow instructions from "Circulation Pump Test", above.	Follows expected behavior from "Circulation Pump Test", then broadcasts CIRCULATION_ PUMP_TIMER_STATUS.	1. All potential failures from "Circulation Pump Test" 2. Instance of CIRCULATION_PUMP_TIMER_STATUS does not match instance of pump commanded. 3. "Pump Override Timer" broadcasts as 0, but CIRCULATION_PUMP_STATUS still indicates "Output Status" is "Test (Forced On)". Exception: see note 5.4.2 Other failures (list in comments)					
WH-**140** Oct. 2025	Configure Water Heater Timer	6.9	During device operation (repeat for each supported operating mode), broadcast WATERHEATER_ CONFIGURATION_COMMAND for DUT's instance with "System timer" field set to a value supported by DUT. Repeat with four additional values supported by DUT, including 0 (disable timer) if supported.	Broadcasts WATERHEATER_ CONFIGURATION_STATUS with "System timer" value after each command.	1. More than 250ms elapses between broadcast of command and DUT's response with WATERHEATER_STATUS. 2. Reported timer value does not change and no explanatory NAK and/or diagnostic message is broadcast. 3. Timer setting reported indicates a different time than was commanded (exception: see failure 4). 4. When receiving a time between supported values (e.g. 52s when only 50s or 55s are supported), does not parse command as the higher supported value. 5. Operating status reported does not represent actual device status – see note 5.4.6 of this document. Other failures (list in comments)					
WH-**150** Oct. 2025	Configure Domestic Water Timer	6.9	During device operation (repeat for each supported operating mode), broadcast WATERHEATER_ CONFIGURATION_COMMAND for DUT's instance with "Domestic water timer" field set to a value supported by DUT. Repeat with four additional values supported by DUT, including 0 (disable timer) if supported.	Broadcasts WATERHEATER_ CONFIGURATION_STATUS with "Domestic water timer" value after each command.	1. All potential failures from "Configure Water Heater Timer" (WH-140). Other failures (list in comments)					

7   *Revision History*

Date	Revision	Description
8-21-25	Rev0	Initial release
10-1-25	Rev1	Make test columns fillable in digital version
10-23-25	Rev2	Add water heater tests
11-12-25	Rev3	Add date watermarks