

**AccuDiag™  
HCV-Ab  
(Sandwich)  
ELISA**

**Cat# 1707-12S**

**“Export Use Only”**

IVD  See external Label  2-8°C  Σ=96 Tests

<b>Test</b>	<b>HCV- Ab (Sandwich)</b>
<b>Method</b>	<b>ELISA: Enzyme Linked Immunosorbent Assay</b>
<b>Principle</b>	<b>Indirect ELISA : Double Antigen Sandwich Coated Plate</b>
<b>Detection Range</b>	<b>Qualitative: Positive &amp; Negative Control &amp; Cut off</b>
<b>Sample</b>	<b>50µl Serum</b>
<b>Total Time</b>	<b>120 ~ min</b>
<b>Shelf Life</b>	<b>12-18 Months</b>
<b>Specificity</b>	<b>99.81%</b>
<b>Sensitivity</b>	<b>100%</b>

**INTENDED USE**

This Diagnostic Automation, Inc. kit is an enzyme-linked immunosorbent assay for qualitative detection of antibodies to hepatitis C virus in human serum or plasma. It is intended for screening blood donors and diagnosing patients related to infection with hepatitis C virus. “Export Use Only”

**SUMMARY AND EXPLANATION**

Hepatitis C virus (HCV) is an envelope, single stranded positive sense RNA (9.5 kb) virus belonging to the family of Flaviviridae. Six major genotypes and series of subtypes of HCV have been identified. Isolated in 1989, HCV is now recognized as the major cause for transfusion associated non-A, non-B hepatitis. The disease is characterized with acute and chronic form although more than 50% of the infected individuals develop severe, life threatening chronic hepatitis with liver cirrhosis and hepatocellular carcinomas. Since the introduction in 1990 of anti-HCV screening of blood donations, the incidence of this infection in transfusion recipients has been significantly reduced.

1. *The first generation* of HCV ELISAs showed limited sensitivity and specificity and was produced using recombinant proteins complementary to the NS4 (c100-3) region of the HCV genome as antigens.
2. *Second generation* tests, which included recombinant / synthetic antigens from the Core (c22) and nonstructural regions NS3 (c33c, c100-3) and NS4 (c100-3, c200) resulted in a remarked improvement in sensitivity and specificity.
3. *The third generation* tests include antigens from the NS5 region of the viral genome in addition to NS3 (c200), NS4 (c200) and the Core (c22). Third generation tests have improved sensitivity and shorten the time between infection with HCV and the appearance of detectable antibodies (window period) to 60 days.

Diagnostic Automation, Inc. anti-HCV v.4 is based on double antigen “sandwich” principle ELISA. This novel for the testing of HCV antibodies method allows detection of very early antibodies including IgM, and IgA in addition to the IgG which is the main target for detection of the previous generation assays. In addition, the method minimizes the unspecific reaction showed by the other methods and thus its utilization increases the specificity in detection.

**TEST PRINCIPLE**

This kit is a two-step incubation enzyme immunoassay, which uses polystyrene microwell strips pre-coated with recombinant HCV antigens expressed in E.coli (recombinant Core and NS3/4/5). Patient’s serum or plasma sample is added together with biotin-conjugated HCV antigens. During the first incubation step, the specific HCV antibodies, if present, will be captured inside the wells as a double antigen “sandwich” complex comprising of the coated, and the biotin-conjugated HCV antigens. The microwells are then washed to remove unbound serum proteins. During the second incubation step, the captured HCV antibodies are detected by adding of HRP-Conjugate. The microwells are then washed to remove unbound conjugate, and Chromogen solutions are added to the wells. In wells positive for HCV antibodies, the colorless Chromogens are hydrolyzed by the bound HRP conjugate to a blue colored product. The blue color turns yellow after stopping the reaction with sulfuric acid. The amount of color intensity can be measured and is proportional to the amount of antibodies captured in the wells, and to the sample respectively. Wells containing samples negative for anti-HCV remain colorless.

**SPECIMEN COLLECTION AND PREPARATION**

1. Either fresh serum or plasma samples can be used for this assay. Blood collected by venipuncture should be allowed to clot naturally and completely – the serum/plasma must be separated from the clot as early as possible as to avoid hemolysis of the RBC. Care should be taken to ensure that the serum samples are clear and not contaminated by microorganisms. Any visible particulate matters in the sample should be removed by centrifugation at 3000 RPM for at least 20 minutes at room temperature, or by filtration on 0.22µm filters. Plasma samples collected into EDTA, sodium citrate or heparin may be tested, but highly lipaemic, icteric, or hemolized samples should not be used as they could give erroneous results in the assay. Do not heat inactivate samples. This can cause sample deterioration.
2. Store samples at 2-8°C. Samples not required for assaying within 3 days should be stored frozen (-20°C or lower). Multiple freeze-thaw cycles should be avoided. For shipment, samples should be packaged and labeled in accordance with the existing local and international regulations for transport of clinical samples and ethological agents.

**MATERIALS AND COMPONENTS**

**Materials provided with the test kits**

1. **Microwell Plate**  
96 wells. Blank microwell strips fixed on white strip holder. The plate is sealed in aluminium pouch with desiccant. 8×12/12×8-well strips per plate. Each well contains recombinant HCV antigens. The microwell strips can be broken to be used separately. Place unused wells or strips in the plastic sealable storage bag together with the desiccant and return to 2-8°C.
2. **Negative Control** **1 vial**  
Blue-colored liquid filled in a vial with green screw cap. 1ml per vial. Protein-stabilized buffer tested non-reactive for HCV antibodies. Preservatives: 0.1% ProClin 300. Ready to use as supplied. Once open, stable for one month at 2-8°C.
3. **POSITIVE CONTROL SERUM** **1 vial**



Red-colored liquid filled in a vial with red screw cap.  
1ml per vial. anti-HCV antibodies diluted in protein-stabilized buffer Preservatives: 0.1% ProClin 300.  
Ready to use as supplied. Once open, stable for one month at 2-8°C.

4. **HRP-CONJUGATE REAGENT** 1 vial

Red-colored liquid filled in a white vial with red screw cap.  
12ml per vial.

Horseradish peroxidase reagent. Ready to use as supplied.  
Once open, stable for one month at 2-8°C.

5. **BIOTIN-CONJUGATE REAGENT** 1 vial

Blue-colored liquid filled in a vial with blue screw cap.  
6ml per vial. Biotinylated

HCV antigens diluted in protein-stabilized buffer. Preservatives: 0.1% ProClin 300.

Ready to use as supplied. Once open, stable for one month at 2-8°C.

6. **STOCK WASH BUFFER** 1 bottle

**DILUTE BEFORE USE**

Colorless liquid filled in a clear bottle with white screw cap.  
50ml per bottle. pH 7.4, 20 × PBS

(Contains Tween-20 as a detergent) The concentrate must be diluted **1 to 20** with distilled/deionized water before use. Once diluted, stable for one week at room temperature, or for two weeks at 2-8°C.

7. **CHROMOGEN SOLUTION A** 1 vial

Colorless liquid filled in a white vial with green screw cap.  
6ml per vial. Urea peroxide solution.

Ready to use as supplied. Once open, stable for one month at 2-8°C.

8. **CHROMOGEN SOLUTION B** 1 vial

Colorless liquid filled in a black vial with black screw cap.  
6ml per vial.

TMB solution (Tetramethyl benzidine dissolved in citric acid).

Ready to use as supplied. Once open, stable for one month at 2-8°C.

9. **STOP SOLUTION** 1 vial

Colorless liquid filled in a white vial with yellow screw cap.  
6ml per vial. Diluted sulfuric acid solution (2.0M H<sub>2</sub>SO<sub>4</sub>).

Ready to use as supplied.

10. **PLASTIC SEALABLE BAG** 1 unit

For enclosing the strips not in use.

11. **CARDBOARD PLATE COVER** 3 sheets

To cover the plates during incubation and prevent evaporation or contamination of the wells.

12. **PACKAGE INSERTS** 1 copy

**Materials required but not provided**

1. Freshly distilled or deionized water.
2. Disposable gloves and timer.
3. Appropriate waste containers for potentially contaminated materials.
4. Disposable V-shaped troughs.
5. Dispensing system and/or pipette (single or multichannel), disposable pipette tips.
6. Absorbent tissue or clean towel.
7. Dry incubator or water bath, 37± 0.5°C.
8. Microshaker for dissolving and mixing conjugate with samples.
9. Microwell plate reader, single wavelength 450nm or dual wavelength 450nm and 630nm.
10. Microwell aspiration/wash system.

**ASSAY PROCEDURE**

1. **Reagents preparation:** Allow the reagents and samples to reach room temperature (**18-30°C**) for at least 15-30 minutes. Check the Wash buffer concentrate for the presence of salt crystals. If crystals have formed in the solution, resolubilize by warming at 37°C until crystals dissolve. Dilute the stock wash Buffer **1 to 20** with distilled or deionized water. Use only clean vessels to dilute the Wash buffer.
2. **Numbering Wells:** Set the strips needed in strip-holder and number sufficient number of wells including three Negative control (e.g. **B1, C1, D1**), two Positive control (e.g. **E1, F1**) and one Blank (**A1**, neither samples nor HRP-Conjugate should be added into the Blank well). If the results will be determined by using dual wavelength plate reader, the requirement for use of Blank well could be omitted. Use only number of strips required for the test.
3. **Adding Biotin-conjugated reagent:** Add **50µl** of biotin-conjugated HCV antigens into each well except in the Blank.
4. **Adding Sample:** Add **50µl** of Positive control, Negative control, and Specimen into their respective wells. **Note: Use a separate disposal pipette tip for each specimen, Negative and Positive Control as to avoid cross-contamination.** Mix by tapping the plate gently.
5. **Incubating (1):** Cover the plate with the plate cover and incubate for **60 minutes at 37°C**. It is recommended to use thermostat-controlled water tank to assure the temperature stability and humidity during the incubation. If dry incubator is used, do not open the door frequently.
6. **Washing (1):** After the end of the incubation, remove and discard the plate cover. Wash each well **5 times** with diluted Wash buffer. Each time, allow the microwells to soak for 30-60seconds. After the final washing cycle, turn the strips plate onto blotting paper or clean towel, and tap it to remove any remainders.
7. **Adding HRP-Conjugate:** Add **100µl** HRP-Conjugate to each well except the Blank.
8. **HRP-Conjugate Incubating(2):** Cover the plate with the plate cover and incubate for **30 minutes at 37°C**.
9. **Washing (2):** At the end of the incubation, remove and discard the plate cover. Wash each well **5 times** with diluted Wash buffer as in **step 6**.
10. **Coloring:** Dispense **50µl** of Chromogen A and **50µl** Chromogen B solution into each well including the **Blank** and mix by tapping the plate gently. Incubate the plate at **37°C for 30 minutes avoiding light**. The enzymatic reaction between the Chromogen A/B solutions produces blue color in Positive control and anti-HCV positive sample wells.
11. **Stopping Reaction:** Using a multichannel pipette or manually, add **50µl** Stop Solution into each well and mix by tapping the plate gently. Intensive yellow color develops in Positive control and anti-HCV positive sample wells.
12. **Measuring the Absorbance:** Calibrate the plate reader with the Blank well and read the absorbance at **450nm**. If a dual filter instrument is used, set the reference wavelength at **630nm**. Calculate the Cut-off value and evaluate the results (**Note:** read the absorbance within **5 minutes** after stopping the reaction).

**Special Instructions for Washing**

1. A good washing procedure is essential to obtain correct and precise analytical data.
2. It is therefore recommended to use a good quality ELISA microplate washer, maintained at the best level of washing performances. In general, no less than 5 automatic washing cycles with dispensing of 350-400µl/well, are sufficient to avoid false positive reactions and high background (all wells turn yellow).
3. To avoid cross-contaminations of the plate with sample or HRP-conjugate, after incubation do not discard the content of the wells, but allow the plate

washer to aspirate it automatically.

4. Anyway, we recommend calibrating the washing system on the kit itself in order to match the declared analytical performances. Assure that the microplate washer's liquid dispensing channels are not blocked or contaminated, and sufficient volume of Wash buffer is dispensed each time into the wells.
5. In case of manual washing, we suggest to perform at least 5 cycles, dispensing 350-400µl/well and aspirating the liquid for 5 times. If poor results (high background) are observed, increase the washing cycles or soaking time per well.
6. In any case, the liquid aspirated out the strips should be treated with a sodium hypochlorite solution (final concentration of 2.5%) for 24 hours, before liquids are disposed in an appropriate way.
7. The concentrated Washing solution should be diluted 1 to 20 before use. For one plate, mix 50 ml of the concentrate with 950ml of water for a final volume of 1000ml diluted Wash Buffer. If less than a whole plate is used, prepare the proportional volume of solution.

## QUALITY CONTROL

Each microplate should be considered separately when calculating and interpreting results of the assay, regardless of the number of plates concurrently processed. The results are calculated by relating each sample's optical density (OD) value to the Cut-off value (C.O.) of the plate. If the Cut-off reading is based on single filter plate reader, the results should be calculated by subtracting the Blank well OD value from the print report values of samples and controls. In case the reading is based on dual filter plate reader, do not subtract the Blank well OD from the print report values of samples and controls.

The assay was standardized against Clinical Standards from the Reference Laboratory for Biological Product under the Ministry of Health, China.

### 1. Calculation of **Cut-off value (C.O.) = \*Nc + 0.12**

\*Nc = the mean absorbance value for three negative controls.

**Example:**

1. Calculation Of No:

Well No	B1	C1	D1
Negative controls OD value	0.02	0.012	0.016

Nc = 0.016

2. Calculation of Cut-off (C.O.) = 0.016 + 0.12 = 0.130

If one of the Negative control values does not meet the Quality control range specifications, it should be discarded and the mean value is calculated again using the remaining two values. If more than one negative control OD value does not meet the Quality control range specifications, the test is invalid and must be repeated.

The test results are valid if the Quality Control criteria are verified. It is recommended that each laboratory must establish appropriate quality control system with quality control material similar to or identical with the patient sample being analyzed.

1. The OD value of the Blank well, which contains only Chromogens and Stop solution, is less than 0.10 at 450 nm.
2. The OD value of the Positive control must be equal to or greater than 0.800 at 450/630nm or at 450nm after blanking.
3. The OD value of the Negative control must be less than 0.100 at 450/630nm or at 450nm after blanking.

## RESULTS

(S = the individual absorbance (OD) of each specimen)

- **Negative Results (S/C.O. <1):** samples giving absorbance less than the Cut-off value are negative for this assay, which indicates that no antibodies to hepatitis C virus have been detected with this anti-HCV ELISA kit. Therefore, the patient is probably not infected with HCV.
- **Positive Results (S/C.O. ≥1) :** samples giving an absorbance greater than, or equal to the Cut-off value are considered initially reactive, which indicates that antibodies to hepatitis C virus have probably been detected using this anti-HCV ELISA kit. Retesting in duplicates of any initially reactive sample is recommended. Repeatedly reactive samples could be considered positive for antibodies to HCV and therefore the patient is probably infected with hepatitis C virus. Blood unit positive for HCV antibodies should be immediately discarded.
- **Borderline (S/C.O. =0.9-1.1) :** Samples with absorbance to Cut-off ratio between 0.9 and 1.1 are considered borderline and retesting of these samples in duplicates is recommended to confirm the results. Repeatedly positive samples could be considered positive for hepatitis C virus infection.

Follow-up and supplementary testing of any anti-HCV positive samples with other analytical system (e.g. RIBA, WB) is required to confirm the diagnosis.

## LIMITATIONS OF PROCEDURE

1. Non-repeatable positive result may occur due to the general biological characteristics of the ELISA method. The assay is designed to achieve very high performance characteristics of sensitivity and specificity and the "sandwich" model minimizes the unspecific reactions due to interference with unknown matters in sample. Antibodies may be undetectable during the early stages of the disease and in some immunosuppressed individuals.
2. Positive results must be confirmed with another available method. Any positive result must be interpreted together with the patient clinical information and other laboratory results.
3. Common sources for mistakes: kits beyond the expiry date, bad washing procedures, contaminated reagents, incorrect assay procedure steps, insufficient aspiration during washing, failure to add samples or reagents, equipment, timing, volumes, sample nature and quality.
4. If, after retesting of the initially reactive samples, the assay results are negative, these samples should be considered as non-repeatable (false positive) and interpreted as negative. As with many very sensitive ELISA assays, false positive results can occur due to the several reasons, most of which are related but not limited to inadequate washing step. For more information regarding ELISA Troubleshooting, please refer to "ELISAs and Troubleshooting Guide", or contact technical support for further assistance.
5. The prevalence of the marker will affect the assay's predictive values.
6. This kit is intended ONLY for testing of individual serum or plasma samples. Do not use it for testing of cadaver samples, saliva, urine or other body fluids, or pooled (mixed) blood.

## INDICATIONS OF INSTABILITY OR DETERIORATION OF THE REAGENTS

1. Values of the Positive or Negative controls, which are out of the indicated Quality control range, are indicator of possible deterioration of the reagents and/or operator or equipment errors. In such case, the results should be considered as invalid and the samples must be retested. In case of constant erroneous results classified as due to deterioration or instability of the reagents, immediately substitute the reagents with new ones, or contact technical support

for further assistance.

- If after mixing of the Chromogen A and B solutions into the wells, the color of the mixture turns blue within few minutes, do not continue carrying out the testing and replace the reagents with fresh ones.

### PRECAUTIONS

The ELISA assay is a time and temperature sensitive method. To avoid incorrect result, strictly follow the test procedure steps and do not modify them.

- This kit is intended **FOR IN VITRO USE ONLY**.
- FOR PROFESSIONAL USE ONLY.**
- Do not exchange reagents from different lots, or use reagents from other commercially available kits. The components of the kit are precisely matched as to achieve optimal performance during testing.
- Make sure that all reagents are within the validity indicated on the kit box and are of the same lot. Never use reagents beyond the expiry date stated on reagents labels or on the kit box.
- CAUTION - CRITICAL STEP:** Allow the reagents and samples to stabilize at room temperature (18-30°C) before use. Shake reagent gently before, and return to 2-8°C immediately after use.
- Use only sufficient volume of sample as indicated in the procedure steps. Failure to do so, may cause in low sensitivity of the assay.
- Does not touch the bottom exterior of the wells; fingerprints or scratches may interfere with microwell reading.
- When reading the results, ensure that the plate bottom is dry and there are no air-bubbles inside the wells.
- Never allow the microplate wells to dry after the washing step. Immediately proceed to the next step. Avoid the formation of air-bubbles when adding the reagents.
- Avoid assay steps long time interruptions. Assure same working conditions for all wells.
- Calibrate the pipette frequently to assure the accuracy of samples/reagents dispensing. Always use different disposal pipette tips for each specimen and reagents as to avoid cross-contaminations. Never pipette solutions by mouth.
- The use of automatic pipettes is recommended.
- Assure that the incubation temperature is 37°C inside the incubator.
- When adding samples, avoid touching the well's bottom with the pipette tip.
- When reading the results with a plate reader, it is recommended to determine the absorbance at 450nm or at 450nm with reference at 630nm.
- All specimens from human origin should be considered as potentially infectious.
- Materials from human origin may have been used in the kit. These materials have been tested with tests kits with accepted performance and found negative for antibodies to HIV 1/2, HCV, TP and HBsAg. However, there is no analytical method that can assure that infectious agents in the specimens or reagents are completely absent. Therefore, handle reagents and specimens with extreme caution as if capable of transmitting infectious diseases. Strict adherence to GLP (Good Laboratory Practice) regulations can ensure the personal safety. Never eat, drink, smoke, or apply cosmetics in the assay laboratory.
- Bovine derived sera may have been used in this kit. Bovine serum albumin (BSA) and fetal calf sera (FCS) are derived from animals from BSE/TSE free-geographical areas.
- The pipette tips, vials, strips and sample containers should be collected and autoclaved for 1hour at 121°C or treated with 10% sodium hypochlorite for 30minutes to decontaminate before any further steps for disposal.
- The Stop solution (2M H<sub>2</sub>SO<sub>4</sub>) is a strong acid. Corrosive. Use it with appropriate care. Wipe up spills immediately or wash with water if come into

contact with the skin or eyes. ProClin 300 used as a preservative can cause sensation of the skin.

- The enzymatic activity of the HRP-conjugate might be affected from dust, reactive chemical, and substances like sodium hypochlorite, acids, alkalins etc. Do not perform the assay in the presence of such substances.
- Materials Safety Data Sheet (MSDS) available upon request.
- If using fully automated microplate processing system, during incubation, do not cover the plates with the plate cover. The tapping out of the remainders inside the plate after washing, can also be omitted.
- Please do not use this kit beyond the expiration indicated on the kit box and reagent labels.**
- The components of the kit will remain stable through the expiration date indicated on the label and package when stored between 2-8°C, **do not freeze**. To assure maximum performance of this HCV ELISA kit, during storage protect the reagents from contamination with microorganism or chemicals.

**ISO 13485**  
**ISO 9001**



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