



Operating Manual

# AST-ID

Automotive Refrigerant Identifier



INFICON

Two Technology Place

East Syracuse, NY 13057-9714

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# 1 Introduction

AST-ID can be used by itself as a stand-alone refrigerant identifier or connected to SAE J2851-certified automotive air conditioning service equipment to provide accurate identification of the refrigerant purity of R134a and R1234yf either within storage cylinders or vehicle air conditioning units. For connection to an AC service machine, connect a USB cable (type A) to the USB socket on the side of the identifier and the other end to the AC service machine. If Data Encryption is selected, the output will be encrypted by AST-ID prior to transmission to the service unit. The service unit will therefore need to have the capability to de-encrypt the data.

AST-ID is designed to be compatible with existing equipment.

## 1.1 Trademarks, Disclaimer, Copyright

### Trademarks

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### Copyright

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## 1.2 AST-ID Kit

AST-ID Refrigerant Identifier is supplied in a hard plastic carrying case with a kit of parts as detailed below.

### Contents

- AST-ID R134a/R1234yf Refrigerant Identifier
- R134a cylinder adapter
- R1234yf cylinder adapter
- R134a vehicle quick connect coupler
- R1234yf quick connect coupler
- Sampling tube with oil restrictor
- AC wall charger (includes plugs for multiple regions)
- Calibration certificate

### 1.3 Scope of the Manual

This manual provides details on the correct and safe use of the stand-alone AST-ID Automotive Refrigerant Identifier when used in automotive air system conditioning applications.

This manual is to be used in conjunction with the AST-ID Automotive Refrigerant Identifier Communications manual.

## 2 Safety Precautions



### **DANGER**

R1234yf is considered mildly flammable. Make sure you are working in a well ventilated area with no open flames.

R134a and/or mixtures of other refrigerants may also be flammable.



### **WARNING**

Suitable safety glasses and gloves must be worn when working with refrigerants, as these can cause frostbite or loss of sight.



### **CAUTION**

Ensure the vehicle engine is turned off and/or the keys are removed from the ignition before carrying out any sample tests.



### **CAUTION**

Avoid breathing refrigerant and oil vapor.

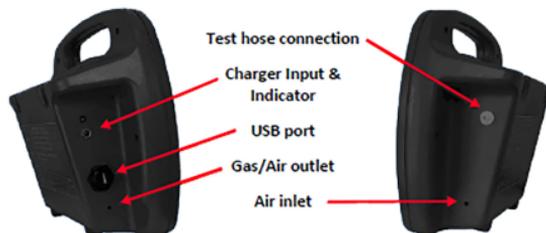


**Working with refrigerants and mixtures of refrigerants is dangerous if the proper safety precautions are not followed. Please ensure anyone using AST-ID has read and understands the following precautions.**

### 3 Overview



1	Display
2	On/Off button
3	Oil filter
4	Pass/Fail and charging indicators
5	Contaminant resistant keyboard



## 4 Charging the Battery

### CAUTION

AST-ID is supplied with a 100 to 240 V (ac) / 9 V (dc) charger. This should always be used to recharge the internal lithium-ion battery. Use of any other power source may cause damage to the electronics and invalidate the product warranty.

The internal battery can be charged with or without AST-ID turned on.

An amber LED indicator next to the charging input socket illuminates when charging, even if AST-ID is turned off.

If AST-ID is turned on, a red LED on the front panel illuminates while charging. When AST-ID is fully charged, the green LED illuminates as shown below.



The charge time can be up to 8 hours depending on the initial state of charge.

### NOTICE

The charge indication can take several seconds to update when the charger is first connected/disconnected.

### 4.1 Using AST-ID While Charging

During charging, AST-ID can be used for gas testing and accessing the menu functions if the battery has at least 10% of its full capacity. This is achieved by pressing the **MENU** button when the display reads "Press Menu to Exit," as shown above.

If the battery charge level is below 10%, gas testing and access to the menu functions is unavailable and the display is as follows:



### 4.2 Auto Power Off

The auto power off function conserves battery when AST-ID is turned on, but is not being used. This works by automatically switching off AST-ID after a preset period of inactivity. The period can be changed within the Settings menu. The setting options are 15, 30, 60 minutes or Disabled.

When AST-ID powers down, the display shows the image below and beeps. To power back on, follow the procedure in Power On [ 9].

## Auto Power Off

## 5 Menu Navigation

AST-ID has a numeric keypad.

Keys 1, 4, 5, 6, and 9 also have menu navigation arrows, as shown below, to navigate the display cursor between the various instrument functions and character entries.



Press  to select a required function/character.

Within functions that require character entry, (ex: operator names), key 5 can be used to delete an entry.

## 6 Set Up and Functions

### 6.1 Power On

Press the power button once. 

The display illuminates and shows the software version. If the display fails to appear, charge the instrument as shown in Charging the Battery [► 8].

Refrigerant  
Identifier

V0.8.0d

AST-ID will enter a 2 minute warm-up state to stabilize the sensor and electronics. During warm-up, the red and green LEDs will alternate.

### NOTICE

If needed, the warm-up state can be skipped by pressing the menu button. It is not recommended to operate AST-ID without warm-up.

#### Warmup...

The instrument takes 2 minutes to warm up. Instructions follow.

#### Warmup...

Check the filter for Signs of discolouration. Replace if necessary!

#### Warmup...

Check sample lines for signs of oil before use. Replace if necessary!

#### Warmup...

Turn on the printer if required. It can take up to 30 secs to connect.

**WARNING**

If oil gets inside AST-ID, it will cause irreparable damage to the sensors and is not covered under any warranty.

Warning messages may appear during the warm-up period, for example:

- Calibration Required!
- Filter Change Overdue!
- Air Sensor Change Overdue!

## 6.2 Setting the Clock/Date

- 1 After warming up, the main page is displayed. Press **MENU** to start.



- 2 Page 1 is displayed. Use the down arrow to go to page 2, **Settings**, then press **ENTER**.



- 3 Use the down arrow to select **Clock/Date** and press **ENTER**.



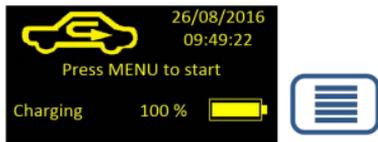
⇒ The **Set Clock** page is displayed.



- 4 Use the up and down arrow buttons to increase or decrease the highlighted values, or scroll through the date format options.
- 5 Use the left and right arrow buttons to move between the **Day**, **Month**, **Year**, **Hours**, **Minutes**, and **Seconds** settings.
- 6 Press  to save the **Clock/Date** settings, or  to exit without saving.

### 6.3 Selecting the Language

- 1 After warming up, the main page is displayed. Press **MENU** to start.



- 2 Page 1 is displayed. Use the down arrow to go to **Settings** and press **ENTER**.



- 3 Page 2 is displayed. Use the down arrow to select **Language** and press **ENTER**.



- 4 The **Set Language** page is displayed. Use the down arrow to select the required language and press  to save the selection, or  to exit without saving.



## 6.4 Setting the Operator Names

- 1 After warming up, the main page is displayed. Press **MENU** to start.



- 2 Page 1 is displayed. Use the down arrow to go to **Settings** and press **ENTER**.



- 3 Use the down arrow to select **Operators** and press **ENTER**.



⇒ The **Set Operator** page is displayed.



Display with no entries.

Display with 3 existing entries.

- 4 Use the down  arrow to make the selection and press  or  to exit.

⇒ A character entry page is displayed and the operator name can be entered.



- 5 Use the arrow keys shown below to navigate the cursor between the characters.



- 6 Press to select the required character and to delete the entry.
- 7 Repeated pressing of the down arrow key navigates to the lower-case letters page, followed by the numbers page.



- 8 Spaces can be added by selecting and entering " ".

- 9 Press to save and exit.

## 6.5 Setting the Company Name

- 1 After warming up, the main page is displayed. Press **MENU** to start.



- 2 Page 1 is displayed. Use the down arrow to go to **Settings** and press **ENTER**.



- 3 Use the down arrow to select **Company** and press **ENTER**.



- 4 Select which line to edit or press **MENU** to exit.



⇒ The **Set Company** page is displayed.

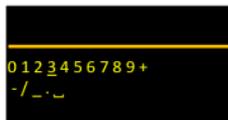
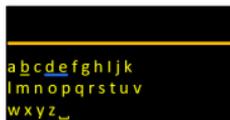


← Entries appear here

- 5 Use the arrow keys shown below to navigate the cursor between the characters.



- 6 Press  to select the required character and  to delete the entry.
- 7 Repeated pressing of the down arrow key navigates to the lower-case letters page, followed by the numbers page.



- 8 Spaces can be added by selecting and entering " ".
- 9 Press  to save and exit.

## 6.6 Bluetooth®

AST-ID can be paired with a Bluetooth printer (sold separately) for printing test results. For AST-ID to communicate with the printer, it's necessary to register the MAC address of the printer. To find the MAC address, follow the instructions in the Bluetooth printer operating manual.

### 6.6.1 Entering the MAC Address

- 1 After warming up, the main page is displayed. Press **MENU** to start.



- 2 Page 1 is displayed. Use the down arrow to go to **Settings** and press **ENTER**.



- 3 Use the down arrow to select **Printer** and press **ENTER**.

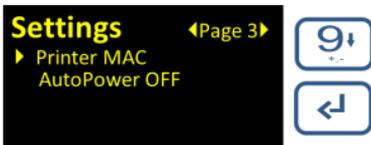


⇒ The **Set Printer** page is displayed.

- 4 Use the down arrow  to select **On** and press **ENTER**.



- 5 Use the down arrow  to select **Printer MAC** and press **ENTER**.



- 6 Press **ENTER**  to edit or **MENU**  to exit.



⇒ The **Set Printer MAC** page is displayed.



← **Entries appear here**

- 7 Enter the MAC address using the arrow keys to navigate the cursor between the characters.



- 8 Press  to select the required character and  to delete the entry.  
9 Upon completion, an up arrow symbol appears as shown below. Press **MENU**  to save and exit.

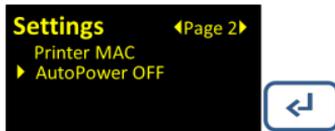


## 6.7 Auto Power Off

The auto power off conserves battery power when AST-ID is switched on but is not being used.

The period of inactivity after which AST-ID enters the power save mode can be set as follows.

- 1 Select **AutoPower OFF** from within the Settings menu and press **ENTER** .



⇒ The **Auto Power Off** page is displayed.

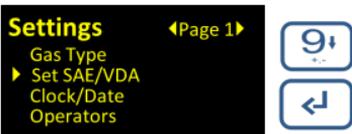
- 2 The cursor points to the current setting. Use the down key to select the required time or disable the function and press **ENTER**  .

- 3 Press **MENU**  to exit.



## 6.8 Set SAE/VDA

- 1 Set the protocol required as follows. Use the down arrow to select Set SAE/VDA on page 1 of the Settings menu and press  .



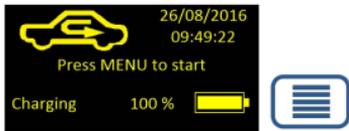
- 2 Using the up or down keys, navigate to the required protocol and press  to save, or  to exit without saving.



## 7 Operation

### 7.1 Selecting R1234yf or R134a Tests

- 1 After warming up, the main page is displayed. Press **MENU**  to start.



- 2 Use the down arrow to go to **Settings** on page 2 and press **ENTER**.



### NOTICE

The latest date of calibration for the selected gas is shown at the bottom of page 2. If the instrument has not been calibrated, "Not Calibrated" is shown instead of the date.

- 3 The cursor will point to Gas Type, press **ENTER**.



- 4 Use the Up/Down arrows to select the required test and press **ENTER**. The selection will now be stored (even when AST-ID is switched off) until it is changed.

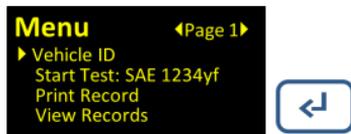


⇒ The selection is shown next to the **Start Test** function on page 1 of the menu.



## 7.2 Entering the Vehicle Details

- 1 Navigate to **Vehicle ID** and press **ENTER**.



- 2 Press **ENTER** to edit and **MENU** to exit.



⇒ The **Vehicle ID** page is displayed.



- 3 Use the arrow keys to navigate the cursor between the characters.



- 4 Press  to select the required character and  to delete the entry.
- 5 Repeated pressing of the down arrow key navigates to the lower-case letters page, followed by the numbers page.



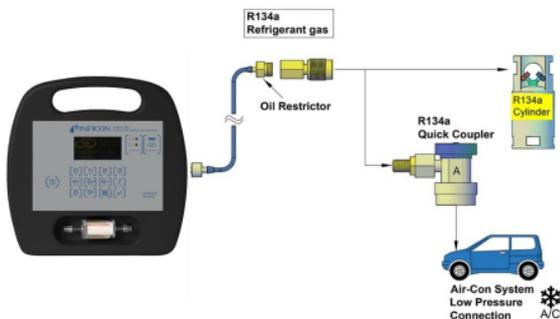
- 6 Spaces can be added within the vehicle ID by selecting and entering " ".
- 7 Press **MENU** to save and exit.

### 7.3 Testing for R134a/R1234yf



Make sure to select the appropriate test according to Selecting R1234yf or R134a Tests [▶ 17], to ensure the correct test is selected.

Selecting an R134a/R1234yf test analyzes the purity of gas in the sample. Either a refrigerant gas cylinder or vehicle air conditioning system can be tested.



### CAUTION

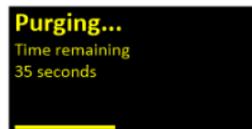
To reduce the possibility of oil contamination, ensure the engine has been off for ten 10 minutes or more. Total purge and test time is 140 seconds.

### Test Procedure

- 1 On page 1 of the menu, navigate to **Start Test** using the down arrow key and press **ENTER**. The **Set Operator** page is displayed.



- 2 Use the  arrow to make the selection and press  or  to exit.
- 3 AST-ID will now purge the system with ambient air.



- 4 After the purge, AST-ID prompts the user to connect the hose.



- 5 The test runs automatically once the vehicle connection is opened, and the flow rate is within the preset limits, on the vehicle or cylinder as per below and takes a maximum of 80 seconds.
- 6 The test results are shown automatically, press **MENU**  to finish the test.



See Printing Test Results With a Bluetooth Printer [ 21 ] on how to print out the results.  
See Stored Results [ 22 ] on how to retrieve stored results.

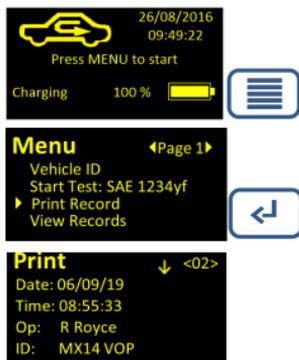
If the analysis results determine that the sample is not pure, it is recommended that the sample be retested. This minimizes incorrect results due to interference from large electrical or RF pulses or extreme temperature changes.

## 7.4 Printing Test Results With a Bluetooth Printer

For successful operation, AST-ID and the printer must be paired as detailed in Bluetooth [ 14 ]. The printer must be switched on and charged, and the printer function within the **Settings** menu must be set to **On**.

When the printer is connected, the results are automatically printed at the end of a R134a or R1234yf test. Printing can also be done from the **Print Records** menu as shown below.

Up to 50 tests can be stored for retrieval and printing with the latest test being shown on the first **Print** screen.



Use  and  to view the record details.

Use  and  to scroll through the records.

Press **MENU**  to exit.

If the printer is found, the results are automatically printed.

The percent refrigerant purity indicated by this equipment includes the amount of air that may be in the refrigerant being tested, but the percentage of non-condensable gases, such as air, is an independent number.

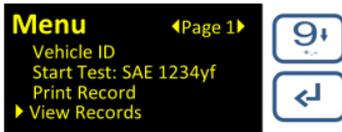
If the refrigerant being tested is identified as contaminated, any visual percentages being displayed of HFC134a (R134a) or HFO1234yf (R1234yf), outside the design certified value is informal and may not be accurate.

If the refrigerant in the sample contains less than 70% of the primary refrigerant, this may be displayed as zeroes in all the analysis categories, indicating that the analysis has completed but the primary gas is less than 70% pure.

With the SAE gas analysis output, any hydrocarbons and/or R152a levels identified are displayed in the HC category.

## 7.5 Stored Results

AST-ID stores the last 50 tests, with the latest test being shown on the first **VIEW** screen. Navigate to page 1 of the menu, select **View Records** and press **ENTER**.



The **Log** screen is displayed.



Use  and  to view the record details.

Use  and  to scroll through the records.

Press **MENU**  to exit.

## 7.6 USB Output

### NOTICE

The USB communications output operates using the protocol specified in Appendix B of SAE standard J2912, December 2014.

Reference should be made to the above standard for full details of the communications protocol. Use the AST-ID Communications Manual for more information.

The USB output is used for the following:

- Transferring test data to A/C service machines
- Transferring test data to a PC
- Uploading vehicle and user information from a PC
- Uploading software updates from a PC
- Re-calibration

## 7.7 AST-ID Config PC Software and Updates

The AST-ID Config PC Application allows the user to do the following:

- Transfer vehicle and operator details to AST-ID
- Check sensor calibration data
- Upload software updates

### NOTICE

See AST-ID Communications manual for more information.

## 8 Bluetooth PC Application

The AST-ID Bluetooth PC application is used as an alternative to using a Bluetooth printer. The application allows the user to send results data to a PC to save or print.

### 8.1 Installation

#### NOTICE

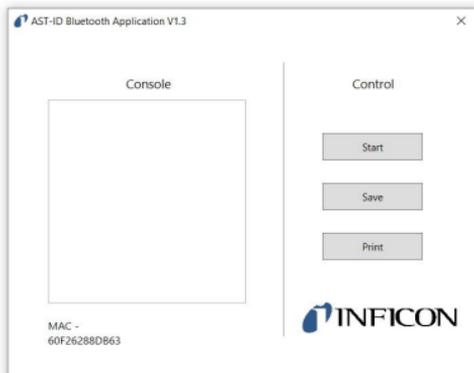
The AST-ID Bluetooth PC application is compatible with Windows® 8.1 and Windows 10 operating systems, and can be downloaded from our website in the form of a .zip file.

- ▶ Extract the files to a suitable folder on your PC and then run the **Setup.msi** file.
- ⇒ This installs the application onto your PC and places a shortcut icon on the desktop as shown below.



## 8.2 Finding the Bluetooth MAC Address

Once the application has installed and launched, the screen below is shown.



The application should display the MAC address of the Bluetooth transceiver.

If the device is not Bluetooth capable or it cannot be found, then the text "Not found" is displayed.

If "Not found" is displayed, ensure that Bluetooth is enabled on your PC. If the error persists, follow the below process to find the MAC address manually.

✓ The following process is for Windows 10.

- 1 Open **Command Prompt** by opening the start menu and searching for **cmd**.
- 2 Type the command **ipconfig/all**.
- 3 After the information about the IP configuration is displayed, find where it says "Ethernet adapter Bluetooth Network Connection."

⇒ The MAC address is displayed next to "Physical Address."

### 8.3 Entering the MAC address into AST-ID

Once the PC Bluetooth MAC address is acquired, it must be entered into AST-ID.

- 1 Press **MENU**  to enter the main menu.



- 2 Select **Settings**, then scroll and select the **Printer** option.



- 3 Set the printer to **On**.



- 4 The option for **Print MAC** should now be available on page 3 of the Settings menu.



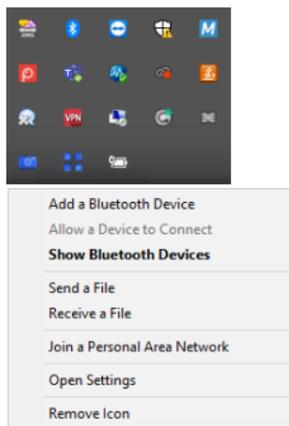
- 5 Set the **Printer MAC** to the address found in Finding the Bluetooth MAC Address [▶ 27].



## 8.4 Pairing AST-ID

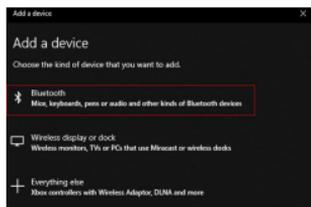
Once the MAC address is entered, AST-ID must be paired with the PC.

- 1 Right-click on the Bluetooth logo in your system tray and click **Show Bluetooth Devices**.



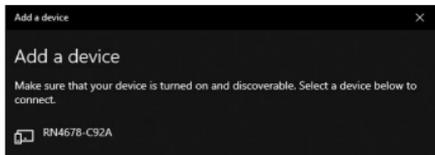
- 2 Click **Add Bluetooth or other device**, then select **Bluetooth**.

### Bluetooth & other devices



- 3 Select AST-ID.

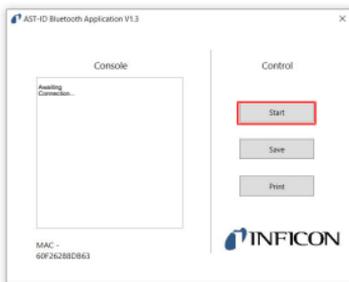
⇒ AST-ID has a device ID in the format of **RNXXXX-XXXX**.



## 8.5 Using the AST-ID Bluetooth Application

✓ The AST-ID Bluetooth Application is now set up.

- 1 To use it, turn AST-ID off and on, then press the start button during warm-up.



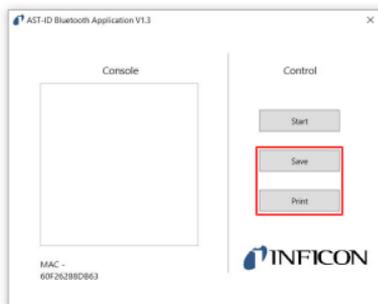
- 2 Half-way through warm-up, "Client Connected!" appears on the console.



- 3 When a test result is printed, the results appear as shown below.



- 4 The user can now save and print using the control buttons on the right.



## 9 Maintenance

### Sample Hose

The sample hose supplied is specifically designed to deliver the correct quantity of refrigerant at the correct pressure to ensure no damage to the instrument. This hose and the brass oil trap should be checked at regular intervals for exterior damage and any traces of oil or debris in the hose itself. Any oil or debris should be completely removed before re-use. If this is not possible, the hose and oil trap needs replacing. See Spare Parts [▶ 33].

### Vehicle Low Side Quick Connect

The R134a and R1234yf vehicle quick connect couplers should be checked at regular intervals for damage, leakages, and correct fit.

### Oil Filter Counter

A message can be displayed to advise the user to change the oil filter after a pre-set number of refrigerant tests have been carried out. The counter must be reset in the **Management** menu each time a new filter is installed.

### Oil Filter Replacement

Allowing oil into the gas sensing chamber of AST-ID causes damage and failure of the identifier, thereby invalidating the warranty.



A replaceable, white, in-line oil filter is provided to minimize the risk of damage if oil enters the sampling hose. Periodic examination of the filter and sample hose is vital. If oil contamination is observed, further testing must cease until the filter and/or hose have been replaced.

The white filter has an activated dye medium that turns red when exposed to oil in the system.

**NOTICE**

Small red spots at the ends of the entry and exit tubes are not necessarily an indication of oil contamination. This may just be powder ink or dust due to the production processes of the filter.

- ✓ To replace, obtain a replacement filter. Make a note of the direction of flow shown on the identifier or existing filter.
- 1 Pull the existing filter out of the retaining clip.
- 2 Carefully uncouple the black rubber tubing from both sides of the filter.
  - ⇒ Do not allow the tubing to slip back into the unit.
- 3 Inspect the hose assemblies for signs of oil contamination.
- 4 Ensure the new filter is aligned in the correct direction of flow and install the tube ends onto the barbs of the new filter.
- 5 Carefully slide the filter and tubing back in place until the new filter is correctly seated into the retaining clip, checking that there are no kinks in the tubing.
  - ⇒ Dispose of the old filter in an environmentally friendly manner. Replacement of the sample filter usually requires replacement of the sample hose with oil restrictor.

**Oxygen Sensor Replacement**

The Oxygen (air) sensor has an expected life span of five years. It needs to be replaced when indicated on the instrument display. Please contact INFICON or your local distributor to have the sensor replaced.

**Clock Battery Replacement**

To maintain the time and date when the instrument is turned off, AST-ID includes a type 2032 3 V lithium coin cell as shown below.



To replace the cell, carry out the following procedure.

- 1 Turn AST-ID off and place it face down on a flat clean surface large enough to accommodate both the front and rear of the case when open.
- 2 Remove the 7 x self-tapping stainless steel screws that hold together the instrument case using a T8 star driver.
- 3 Open the case and carefully separate the two halves without disturbing the wiring or tubing. Lay the rear of the case flat on the surface.
- 4 Note the orientation. Then, carefully remove the battery from its holder and replace it with a new one of the same type.
- 5 Reassemble the unit.
- 6 Set the time and date as described in Setting the Clock/Date [▶ 10].

## 10 Management/Password

Management of the identifier operation is carried out using a password protected menu. The password can be provided to approved users upon request.

The management menu contains the following functions:

- **Calibration** - allows re-calibration of AST-ID
- **Oxygen Sensor** - registers when the oxygen sensor is replaced
- **Oil Filter Counter** - pre-sets the oil filter replacement count
- **Diagnostics** - for use by INFICON personnel only
- **Restore Backup**

### 10.1 Calibration

To ensure optimum accuracy and sensitivity of AST-ID, it is advisable to periodically re-calibrate the instrument against reference cylinders of 100% R1234yf and 100% R134a.

It is recommended that re-calibration is carried out at least every five years. The calibration procedure can be provided by request. For more information, contact INFICON using the contact details provided on the back cover.

### 10.2 Diagnostics

The diagnostics menu is for use by INFICON only. It contains various pages of data about the performance of AST-ID electronics and is useful in the diagnosis of faults.

## 11 Engineer

The **Engineer** menu is for use by INFICON and is unavailable to the user.

## 12 Troubleshooting

### NOTICE

If you find that any of the remedies below do not resolve the issue, contact INFICON.

Problem	Cause	Remedy
There is no display or there is a Low Battery message	The battery requires charging	Refer to Charging the Battery [ 8].
The Clock/Date is incorrect	The clock battery requires changing or the Clock/Date setting needs to be updated	Replace the battery, refer to Clock Battery Replacement. Update the Clock/Date, refer to Setting the Clock/Date [ 10].
There is a Temperature Range error message displayed	The ambient temperature is too low or too high	Move the instrument to an area within the temperature range of 10°C and 49°C.
There is no printer output	The printer is turned off	Turn the printer on.
	The printer is not paired	Pair the printer and identifier, refer to Bluetooth [ 14].
	The print option is turned off in the <b>Settings</b> menu	In the <b>Settings</b> menu, turn the printer option to <b>On</b> .
AST-ID is unable to carry out tests	The pressure in the hose is too high or too low	Check that the vehicle connector is open.
		Check for oil in the hose or oil trap.
		Check that there is pressure in the A/C system.
There are red spots on the oil filter	There is oil ingress	Check the hose and oil trap. Clean or replace the hose assembly, refer to Oil Filter Replacement.  NOTE: Do not use AST-ID until the filter is replaced.
There is no keypad response	There is a possible software issue	Turn AST-ID off for 10 seconds before turning it back on.
There is no gas selected	The refrigerant gas type has not been selected	Select either R134a or R1234yf as required in the <b>Settings</b> menu, refer to Selecting R1234yf or R134a Tests [ 17].

## 13 Specifications

Refrigerants and other vapors identified	R134a and R1234yf
Design standard	SAE J2912
Operating pressure	22 - 174 psi (1.5 - 12 Bar)
Sample type	Vapor only
Sample volume	Less than 5 grams per test
Operating temperature range	10 - 49°C (50 - 120°F)
Sensor type	NDIR - non-dispersive infrared
Warm-up time	2 minutes after power on
Rechargeable battery	Lithium-ion, 7.4 V/ 2250 mAH
Clock battery	7.4 V Lithium-ion
AC power input to mains charger	100-240 V(ac), 50/60 Hz, 0.4 A
Mains charger output voltage	9 V(dc)
Maximum charging voltage	14.5 V(dc)
Operating time on fully charged battery	8 hours typical
Expected air sensor lifetime	5 years
Test cycle time (purge and test)	140 seconds
Communication portal	USB 3.0
Printer communication	Bluetooth 4.2
Stored test results capability	50 tests maximum
Weight	2.7 lb. (1.25 kg)
Approvals	SAE J2912, CE, EMC, UL 61010
Certifications	CE, UKCA, ROHS, ISO 9001:2015 Certified to meet SAE J2912

## 14 Spare Parts

Description	Part number
Bluetooth printer	505-603-P1
Printer roll (paper)	502-604-P1
Sample hose with oil restrictor	505-701-G1
Wall charger with international plugs	033-0097
Oil filter	505-707-P1
7.4 V lithium-ion battery	505-708-P1
R134a vehicle quick connect coupler	505-702-P1
R1234yf vehicle quick connect coupler	505-703-P1
R134a cylinder adapter	505-704-P1
R1234yf cylinder adapter	505-705-P1

Please contact INFICON for service, repair and spare parts.

## 15 Warranty and Liability-Limitation

INFICON warrants your instrument to be free from defects of materials or workmanship for one or two years (depending on region) from the date of purchase. INFICON does not warrant items that deteriorate under normal use, including batteries, sensors, and filters. In addition, INFICON does not warrant any instrument that has been subjected to misuse, negligence, or accident, or has been repaired or altered by anyone other than INFICON. INFICON liability is limited to instruments returned to INFICON, transportation prepaid, not later than thirty (30) days after the warranty period expires, and which INFICON judges to have malfunctioned because of defective materials or workmanship. INFICON liability is limited to, at its option, repairing or replacing the defective instrument or part. This warranty is in lieu of all other warranties, express or implied, whether of MERCHANTABILITY or of FITNESS FOR A PARTICULAR PURPOSE or otherwise. All such other warranties are expressly disclaimed. INFICON shall have no liability in excess of the price paid to INFICON for the instrument plus return transportation charges prepaid. INFICON shall have no liability for any incidental or consequential damages. All such liabilities are EXCLUDED.



Two Technology Place  
East Syracuse, NY 13057-9714  
USA Phone: +1.800.344.3304  
E-Mail: [service.tools@inficon.com](mailto:service.tools@inficon.com)

[www.inficonservicetools.com](http://www.inficonservicetools.com)

Bonner Strasse 498

D-50968 Cologne, Germany  
Phone: +49 221 56788-660  
E-Mail: [servicetools.europe@inficon.com](mailto:servicetools.europe@inficon.com)  
[www.inficonservicetools-europe.com](http://www.inficonservicetools-europe.com)

Section A, Building 6  
108 Shuya Road, Shanghai, China  
Phone: +86-21-62093094  
E-mail: [reach.china@inficon.com](mailto:reach.china@inficon.com)

Korea  
Phone: +82-31-206-2890  
E-mail: [reach.korea@inficon.com](mailto:reach.korea@inficon.com)

Japan  
Phone: +81-44-322-8901  
E-mail: [reach.japan@inficon.com](mailto:reach.japan@inficon.com)

Singapore  
Phone: +65-6631-0303  
E-mail: [reach.singapore@inficon.com](mailto:reach.singapore@inficon.com)

Taiwan  
Phone: +886-3-5525828  
E-mail: [reach.taiwan@inficon.com](mailto:reach.taiwan@inficon.com)

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