TIF

4000A ELECTRONIC SIGHTGLASS

OWNER'S MANUAL

CE

MAINTENANCE

The TIF4000A is a portable, battery operated electronic sight-glass. This instrument operates on the following principle: The TIF4000A "sees" into refrigerant tubing by means of ultrasonics. The method is somewhat related to the SONAR principle. Two sensors are used, one for transmitting and one for receiving. These sensors are in the form of clamps for ready attachment to the outside of any metallic refrigeration tubing. No mechanical penetration of the tubing is necessary. Until now, in the absence of a system sightglass, there has never been a reliable method for ascertaining whether a refrigeration system is properly charged. Cap tube and CCOT (automobile) systems do not have an optical sightglass; even if one were inserted it would not be useful because cap tube systems often have bubbles in the liquid line when the refrigerant charge is correct. In expansion valve systems the TIF4000A "sees" bubbles which are often missed in the optical sight-glass, even when a good light source is available.

The TIF4000A alerts you to conditions in the system in two ways. An audible beeping sound quickens as bubbles or splashes are sensed, and a row of LEDs light, simulating bubble movement in the tubing.

FEATURES

- Visual LED Bubble indicators
- Eliminates the need for an optical sight glass.
- Optimizes refrigerant charge for maximum cooling.
- Detects starved evaporators.
- Checks for refrigerant floodback.
- Maximizes evaporator capacity.
- Aids in adjusting thermostatic expansion valves.
- Operates on any metal tubing.
- Useful on expansion valve, orifice tube and capillary tube systems.
- Will not penetrate or deform tubing.
- Operates through use of ultrasonics.
- Cordless operation.
- Transducer clamps fit tubing from 1/8" to 1-1/4" in diameter.
- One Year Warranty
- Made in U.S.A.

APPLICATIONS

- Household and commercial refrigerators and freezers
- Household and commercial central air conditioners
- Package systems-window air-conditioners, room units
- All automobiles
- Detect starved evaporators
- Multiple evaporator balancing
- Remote and/or split systems
- Detect air bubbles in diesel fuel systems
- Detect suction side leaks on heating system fuel lines.

PRODUCT WARNINGS

- Always wear safety goggles when working on AC&R systems.
- This instrument should be used only by trained personnel who are familiar with, and follow good work and safety practices of the air conditioning and refrigeration trade.
- The unit is **not** intended as a substitute for recommended or usual safe procedures.
- Do not add refrigerant without measuring the high side pressure. Serious injury can result to personnel if pressure becomes excessive due to mechanical defect.
- This instrument is not for use on defective systems.

OPERATING INSTRUCTIONS

Set-up

Before using the TIF4000A you must first install the battery (included) as described in the Maintenance Section.
Note: In order to ensure proper readings the clamps **must** be placed directly on a **metal** line.

If the instrument is switched on with the sensors disconnected a continuous ringing will occur. It is recommended that the unit be switched on first then connected. Once the sensors are connected the ringing should reduce to a once per second "beep" indicating proper installation. If a continued ringing occurs, it indicates a poor connection. Check installation, a good connection is achieved when only the once per second beeping is heard.

Caution: The above must be done with the system OFF. Otherwise false readings will occur.

Charging Capillary Tube System

In order for an evaporator to function with 100% efficiency, there must be liquid refrigerant along its whole length. If, for example, the liquid refrigerant lies along only 2/3rds of its length, evaporator efficiency will be about 2/3rds since 1/3rd of its length will be filled with cold gas (not liquid) which has a specific heat far less than the latent heat of vaporization present in the liquid. Thus, a cap tube system is properly charged and functioning at 100% (and minimum power consumption) whenever the evaporator has full liquid availability. If the evaporator is precisely charged with liquid a slight amount of it will "splash" or boil over into the suction line (see Fig. 1). This boiling or splashing of liquid refrigerant in the suction line is a normal condition of proper operation. Then and only then is the system properly filled. However, it is exceedingly small and difficult to detect by any means other than the system used by the TIF4000A. Here is the correct procedure (follow it carefully).

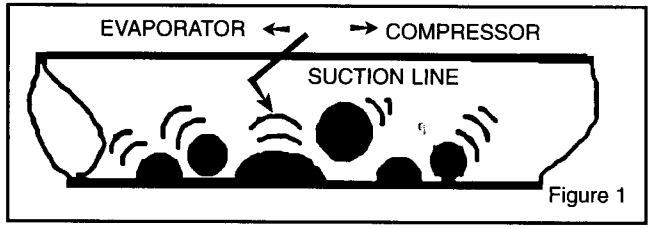


Figure 1

1. Attach the sensors

Note: In order to ensure proper readings, the clamps must be placed directly on a **metal** line.

Attach the sensors to the suction line as close as possible to the outlet of the evaporator (see Fig. 2) Space them so they are not touching one another. First, and foremost, the clamps must be properly seated on the outlet tube. Test as explained on page 3.

Note that liquid continues to circulate in the suction line long after (up to 1 hour) the compressor is turned off. Do not be misled, because the TIF4000A readily detects this shutdown circulation.

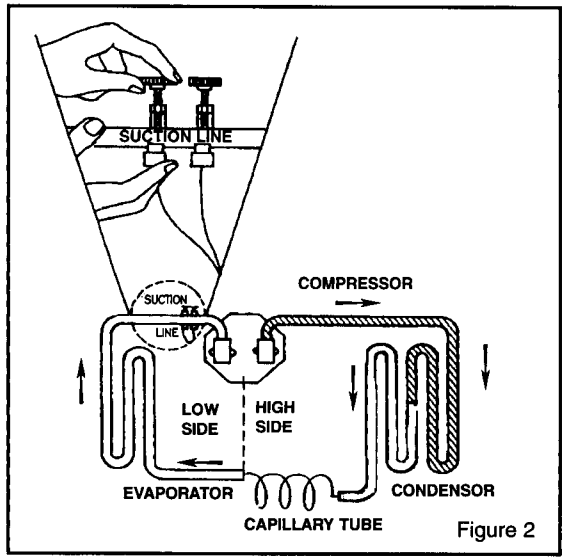


Figure 2

OPERATING INSTRUCTIONS

2. How to test for proper refrigerant charge.

Turn on the compressor and let the system reach equilibrium (full cooling). After the system is stabilized the TIF4000A is turned on with the following response:

Condition #1

OCCASSIONAL BEEPING AND SOME LEDs ARE ALIGHT

Analysis: The system is properly filled since "splashback" is occuring.

OR

Condition #2

ONCE PER SECOND BEEPING, NO LEDs ALIGHT

Analysis: The refrigerant charge is low, or the system has some mechanical defect. Check pressure gauges.

3. How to add refrigerant.

WARNING: Never, under any circumstances should refrigerant be added without using gauges to measure head pressure. Serious injury can result to personnel or to the system if the pressure becomes excessive owing to a mechanical defect (for example, blocked cap tube).

Allow the system to reach a cooling equilibrium as discussed above. Turn on the instrument and slowly add the refrigerant. Allow time for the added charge to be circulated. When the instrument begins to "beep" more frequently and the LEDs begin to light, stop charging.

Charging Expansion Valve Systems

In these systems the TIF4000A is used in place of a conventional sightglass to detect bubbles in the liquid line.If a sightlglass is already in the line the sensors can be clamped near it for a check. It will be found that the TIF4000A is much more convenient since the audible signal permits other service operations simultaneously.

Note: In order to ensure proper readings, the clamps must be placed directly on a **metal** line.

1. Attach the sensors

Both sensors must be clamped to the **liquid line** so that good seating and solid contact with the tubing occurs (see Fig. 3) The sensors should be located adjacent to each other, about an inch or an inch and a half apart. They will not operate properly when touching one another. Test as explained on page 3.

If the compressor had been operating and was turned off only minutes earlier, steady or intermittent ringing may occur. The instrument is then detecting refrigerant which continues to circulate for many minutes after the compressor is turned off.

2. How to test for proper refrigerant charge.

Turn on the compressor and wait until the system has reached its steady running state. Turn on the instrument to obtain the results of its search for bubbles in the liquid line.

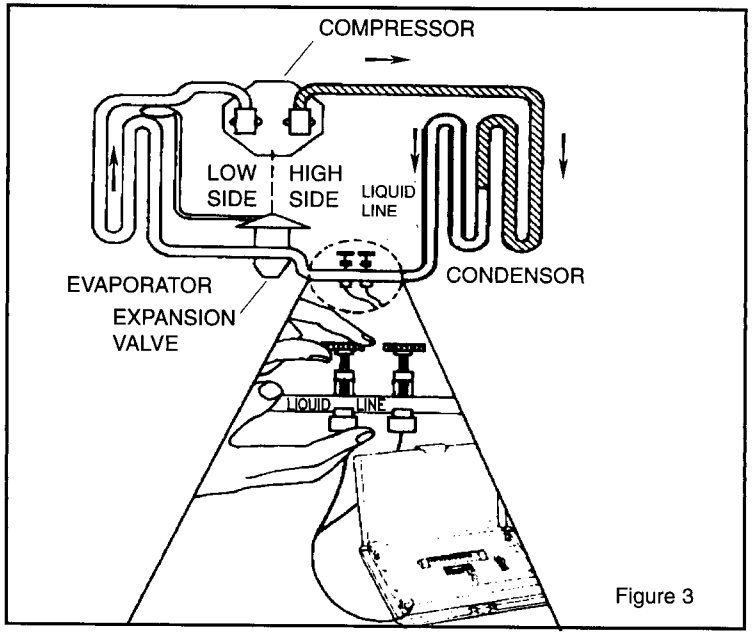


Figure 3

The instrument can signal in three different ways:

a) STEADY BEEPING, ALL LEDs LIT

This means clouds of bubbles are in the tube. The optical sightglass will look like this.

b) INTERMITTENT BEEPING, LEDs LIGHTING IN SEQUENCE

This means sporadic or occasional bubbles, rather than a cloud. The optical sightglass will look like this.

c) LITTLE OR ONCE PER SECOND BEEPING, FEW OR NO LEDs LIT

This means the liquid line is full without bubbles. However if it is completely empty, it will emit the same signal. Use your gauges to be certain the system is not empty. The optical sightglass will look like this.

3. Adding a refrigerant charge.

As always, follow caution when adding refrigerant to a system. It will be found from experience that steady continuous ringing is identified with heavy clouds of bubbles indicating lack of refrigerant. Gradually add refrigerant until intermittent sporadic ringing or intermittent lights (which signifies only occasional individual bubbles) is attained. At this point the system can be considered properly filled. It is usually unnecessary to add refrigerant until the last bubble disappears.

Warning:
Always measure high side pressure when adding refrigerant. Serious injury to personnel can result if pressure is excessive.

OPERATING INSTRUCTIONS

Charging Automobile Air Conditioning Systems

Although two different types of system (expansion valve and CCOT) are used on today's vehicles, the TIF4000A is connected in the same fashion for either type. The following instructions apply to all makes and models, foreign and domestic. Therefore, whether you are charging a Ford, a Chevy, a Toyota or a Mercedes the same procedure applies.

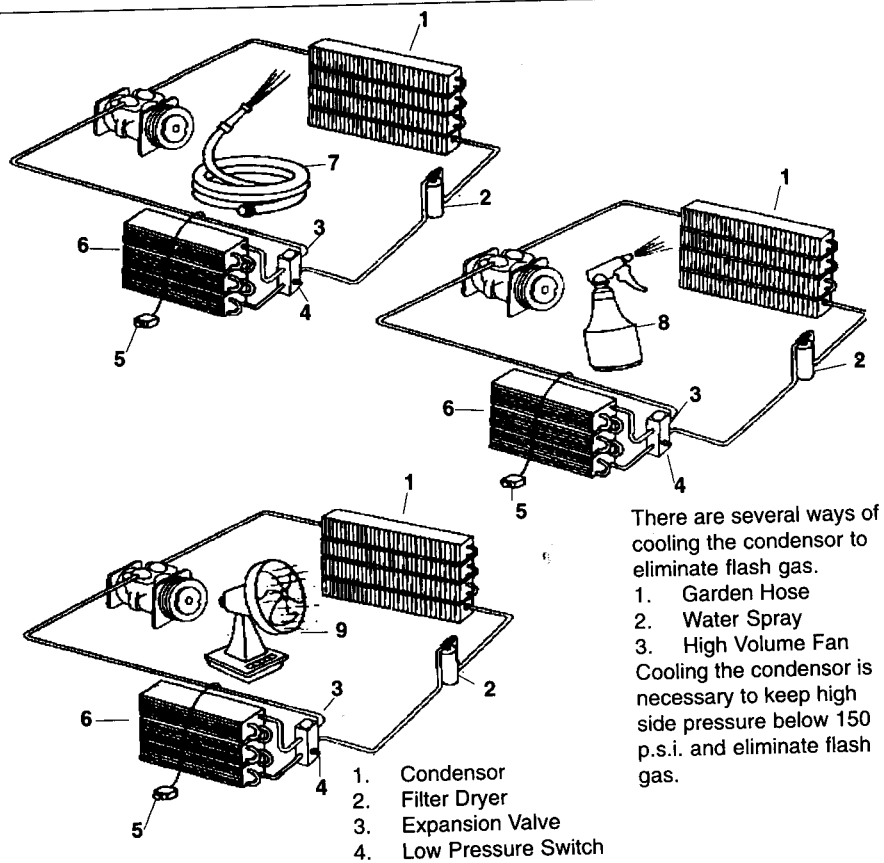
How to Test for Proper Refrigerant Charge:

1. Attach your manifold gauge set to the high and low side service fittings.
2. Attach the electronic sightglass sensors to the liquid line (See Fig. 3) and test as explained on page 3.
3. Start engine, set idle speed at 900-1000 RPM and turn on A/C system. Wait 5 minutes for the system to stabilize and turn on the instrument.
4. Listen for the ringing or LEDs lighting in sequence. Ringing or lights means bubbles in the liquid line. An indication of a low refrigerant charge.

Note:
During testing the car is stationary (at rest). The air conditioning system does not operate efficiently when the car or truck is stationary. In a moving car the ram action of the air over the condenser cools the hot gas in the condenser to form a high pressure liquid. In a stationary car this air movement is missing. When testing it is necessary that the liquid line contains warm high pressure liquid refrigerant to form a liquid seal at the orifice tube or expansion valve. One way to do this is to spray the condenser with water (see Fig. 4). This will help keep the condensing pressure at approximately 150 p.s.i. and load the liquid line with high pressure liquid refrigerant.

Set the A/C control to "Max" and run with a door or window open to put maximum load on the system. This, in conjunction with cooling the condenser, will ensure that no liquid refrigerant is being held in the low side accumulator. It will also make sure that the compressor runs continuously, without "cycling."

MAINTENANCE



There are several ways of cooling the condensor to eliminate flash gas.
1. Garden Hose
2. Water Spray
3. High Volume Fan

Cooling the condensor is necessary to keep high side pressure below 150 p.s.i. and eliminate flash gas.

1. Condensor
2. Filter Dryer
3. Expansion Valve
4. Low Pressure Switch
5. Thermostatic Switch
6. Evaporator
7. Garden Hose
8. Water Spray
9. High Volume Fan

Figure 4

How to Add Refrigerant:

1. Follow steps 1, 2, & 3 on pg. 5-6.
   Be certain high pressure gauge reading is approximately 150 p.s.i.

NOTE: Instrument now signals in one of two different ways...

(1) Steady beeping with LEDs lighting. This means bubbles in the liquid line. System needs more refrigerant.

(2) Once per second beep, no LEDs lit. System is properly filled. No need to continue.

2. If necessary, add refrigerant slowly (i.e. 1/4 lb./5 mins.) until the continuous beeping ceases and is replaced by an intermittent beep signal. Add small amounts of refrigerant until only the once per second beep is heard and no LEDs are lit. System is now properly filled.

CONDENSED INSTRUCTIONS

CAP TUBE

SENSOR LOCATION	On **metal** suction line at evaporator outlet. Sensors must not touch each other.
AUDIBLE AND VISUAL SIGNALS	A. ONCE PER SECOND BEEP, Means: Gas Only, No splashing, Add refrigerant. ○○○○○○○○ B. OCCASIONAL BEEPS Means: Occasional Splashing, Liquid available for full length of evaporator, Stop charging. ●○○○●○○○
ADD REFRIGERANT	When there is *no splashing* WARNING: Defects in the refrigeration system may prevent splashing or floodback, although the system is full. (For example; blocked capillary.)

EXPANSION VALVE SYSTEMS AND ORIFICE TUBE SYSTEMS

SENSOR LOCATION	On **metal** liquid line. Must not touch each other.
AUDIBLE AND VISUAL SIGNALS	A. ONCE PER SECOND BEEP, Means: No Bubbles, FULL SYSTEM ○○○○○○○○ B. OCCASIONAL BEEPS Means: Occasional Bubbles, Partial Fill ●○○○●○○○ C. CONTINUOUS BEEPS Means: Clouds of Bubbles, Undercharged ●●●○●●○●
ADD REFRIGERANT	Use the usual practice, same as the conventional optical sightglass.

MAINTENANCE

As with all electronic instruments, maintenance on the TIF4000A is minimal. Keep the instrument clean and dry and avoid prolonged exposure to very hot and/or humid conditions. From time to time inspect the sensors and leads for damage, and have replaced if necessary.

Battery Installation/Replacement

Upon initially unpacking the unit the 9V battery included must be installed. Remove the battery compartment cover by gently pulling up on each plastic peg and then lifting the cover away. Connect battery to pigtail connector and replace compartment lid. Gently push down on pegs until they 'snap' down. Battery replacement is required when the unit does not power up when switched on. See page 3 for a description of "power on" signals. There is no other low battery indicator.

SPECIFICATIONS

Weight:	22 ounces (616 g) with batteries
Dimensions:	8 1/2" x 7" x 2" (21.6 x 17.8 x 5.1 cm)
Sensor Cord Length:	42 inches (≈ 1 m)
Tubing Capacity:	1/8" to 1-1/4" (3.175mm to 31.75 mm) diameter
Warm-Up Time:	Instantaneous
Power Supply:	One 9V battery
Battery:	30 hours continuous operation (alkaline)
Operating Temperature:	32° F to 125° F (0° C to 52° C)

WARRANTY & REPAIR

Limited Warranty and Repair/Exchange Policy

This instrument has been designed and manufactured to provide unlimited service. Should the unit be inoperative, after performing the recommended maintenance, a no charge repair or replacement will be made to the original purchaser if the claim is made within one year from the date of purchase. This warranty applies to all repairable instruments that have not been tampered with or damaged through improper use.

This warranty does not cover batteries, or any other materials that wear out during normal operation of the instrument.