

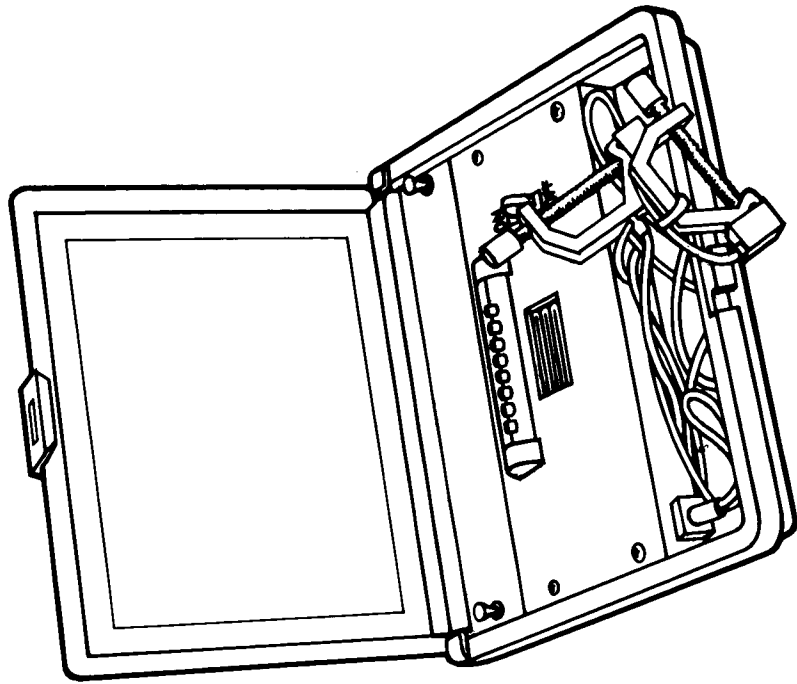
Snap-on®

ACT4040

Electronic

Sightglass

OWNER'S MANUAL



Warning:

This instrument should be used only by competent personnel who are familiar with, and follow good work and safety practices of the air conditioning and refrigeration trade. It is not intended as a substitute for the 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.

Table of Contents

P. 4	Brief discussion of the patented Electronic Sightglass
P. 6	Charging a Capillary Tube System
P. 9	Charging an Expansion Valve System
P. 12	Charging an Automobile Air Conditioning System
P. 16	Condensed Instructions
P. 18	Specifications

The ACT4040

Electronic Sightglass

is a portable, battery operated electronic sightglass. This instrument operates on the following principle: The ACT4040 "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. Some manufacturers advocate dumping the charge completely and then refilling with the amount of refrigerant specified on the nameplate. However, this method is not only time consuming and expensive, but it unnecessarily contaminates the environment. 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 ACT4040 "sees" bubbles which are often missed in the optical sightglass, even when a good light source is available.

The ACT4040 alerts you to condi-

tions in the system in two ways. An audible beeping sound quickens as bubbles or floodback are sensed, and a row of LEDs lights, simulating bubble movement in the tubing.

Power On Indication

If the instrument is switched on with the sensors disconnected a continuous ringing will occur. Therefore it is recommended that the sensors be attached before testing begins. Once they are connected switch the unit on to check for proper installation. The unit will emit a single beep and light the LEDs in sequence. If a continuous ringing occurs, it indicates a poor connection. Check installation and repeat test. Once this is complete, turn the instrument off and proceed as in-

structed in the following sections.

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.

Charging Capillary Systems

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 filled with liquid a slight amount of it will "splash" or boil over into the suction

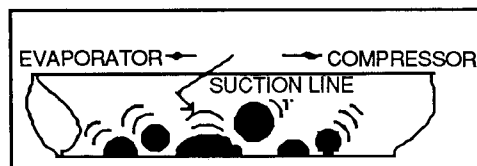


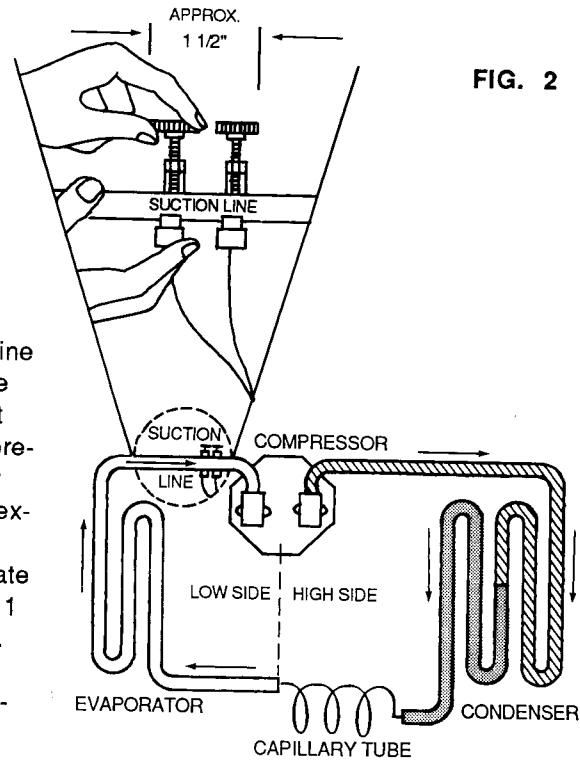
FIG. 1

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, floodback into the suction line is exceedingly small and difficult to detect by any means other than the system used by the ACT4040. Here is the correct procedure (follow it carefully).

1. Attach the sensors

Attach the sensors to the suction line at 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 5.

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 ACT4040 readily detects this shut-down circulation.



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 ACT4040 is turned on with the following response:

Condition # 1

THE INSTRUMENT IS BEEPING ALMOST CONTINUOUSLY AND THE LEDs ARE ALIGHT

Analysis: The system is properly filled since "floodback" has been achieved.

OR

Condition # 2

NO 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. Nearly continuous beeping represents an exact charge for full efficiency.

Charging Expansion Valve Systems

In these systems the ACT4040 is used in place of a conventional sightglass to detect bubbles in the liquid line. If a sightglass is already in the line the sensors can be clamped near it for a check. It will be found that the ACT4040 is much more convenient since the audible signal permits other service operations simultaneously.

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 5.

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 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.

The instrument can signal in **three** different ways:

a) STEADY BEEPING, ALL LEDs LIT

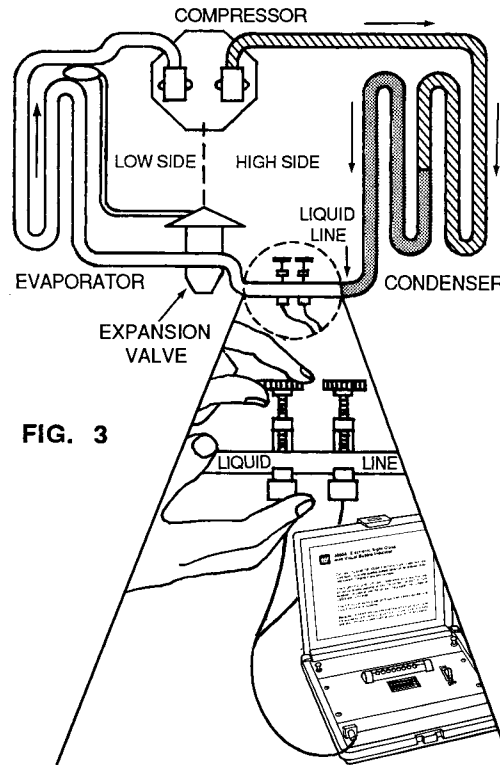


This means clouds of bubbles are in the tube. The optical sightglass will look like this.

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 NO 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.

Charging Automobile Air Conditioning Systems

Although two different types of system (expansion valve and CCOT) are used on today's vehicles, the ACT4040 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 Buick, 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.

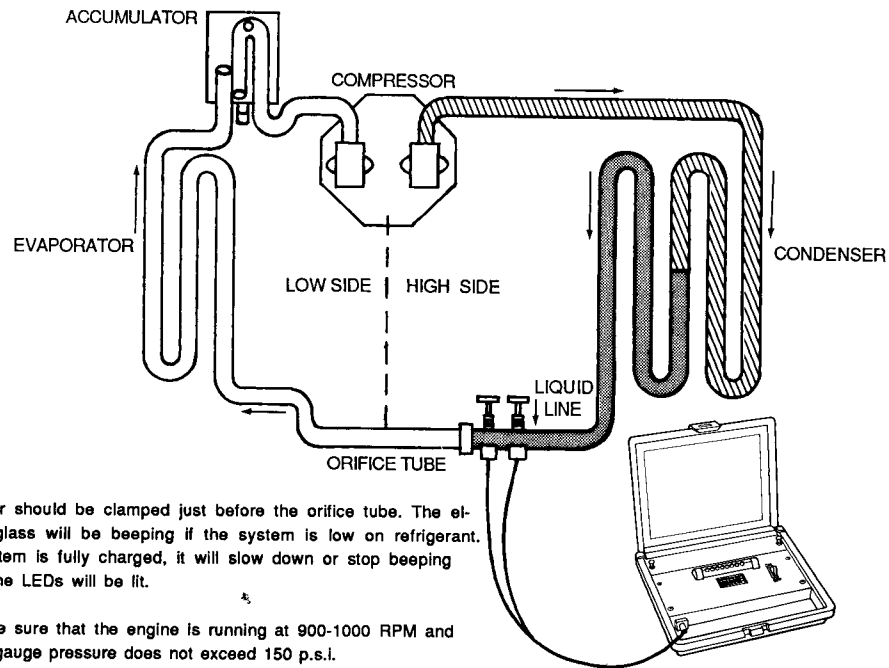
2. Attach the electronic sightglass sensors to the liquid line (See Fig. 4) and test as explained on page 5.
3. Start engine, set idle speed at 900-1000 RPM and turn on A/C system. Wait 5 minutes for the system to stabilize and turn on the instrument.
4. Listen for the ringing or LEDs lighting in sequence. 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

CCOT-Fixed Orifice Tube

FIG. 4



The transducer should be clamped just before the orifice tube. The electronic sightglass will be beeping if the system is low on refrigerant. When the system is fully charged, it will slow down or stop beeping and none of the LEDs will be lit.

Important: Be sure that the engine is running at 900-1000 RPM and the high side gauge pressure does not exceed 150 p.s.i.

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. 5). This will help keep the condensing pressure at approximately 150p.s.i. and load the liquid line with high pressure liquid refrigerant. Set the A/C control to "Max" and run with a car 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."

How to Add Refrigerant:

1. Follow steps 1, 2, 3, & 4 above. Be certain high pressure gauge reading is approximately 150p.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) No beeps, 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 no beeping is heard and no LEDs are lit. System is now properly filled.

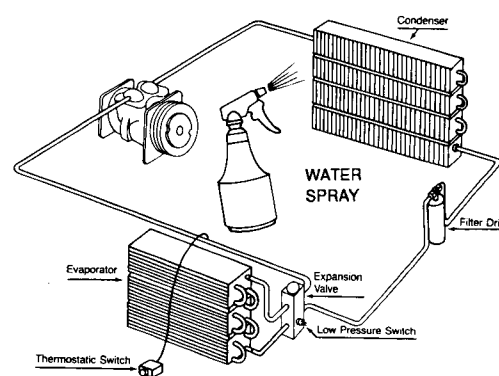
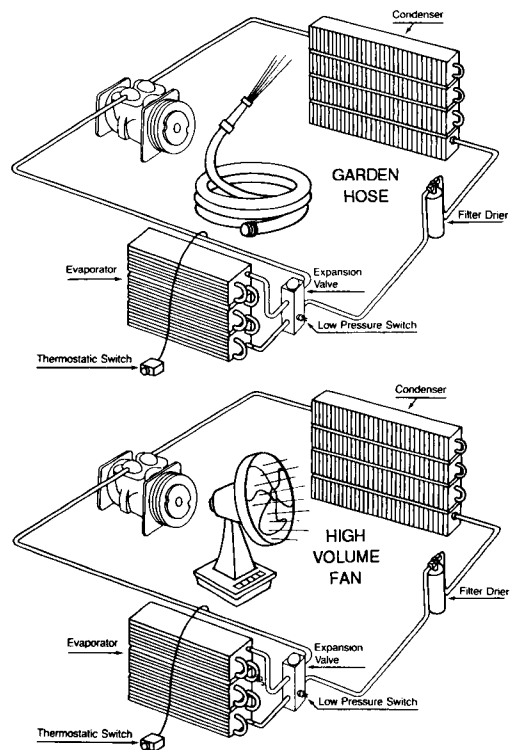


FIG. 5




There are several ways of cooling the condenser to eliminate flash gas.

1. Garden Hose
2. Water Spray
3. High Volume Fan




Cooling the condenser is necessary to keep high pressure below 150 P.S.I. and eliminate flash gas.

ELECTRONIC SIGHTGLASS
CONDENSED INSTRUCTIONS

CAP TUBE

SENSOR LOCATION	On suction line--between evaporator and accumulator, sensors must not touch each other.
AUDIBLE AND VISUAL SIGNALS	<p>A. NO BEEPS,  Means: Gas Only, No Splashing</p> <p>B. OCCASIONAL BEEPS  Means: Occasional Splashing</p> <p>C. CONTINUOUS BEEPS  Means: Floodback FULL SYSTEM</p>
ADD REFRIGERANT	<p>When there is <i>no splashing or <u>floodback</u></i> WARNING: Defects in the refrigeration system may prevent splashing or floodback, although the system is full. (For example; blocked capillary.)</p>

ELECTRONIC SIGHTGLASS
CONDENSED INSTRUCTIONS
**EXPANSION VALVE SYSTEMS
and ORIFICE TUBE SYSTEMS**

SENSOR LOCATION	On liquid line. Must not touch each other.
AUDIBLE AND VISUAL SIGNALS	<p>A. NO BEEPS,  Means: No Bubbles, FULL SYSTEM</p> <p>B. OCCASIONAL BEEPS  Means: Occasional Bubbles, Partial Fill</p> <p>C. CONTINUOUS BEEPS  Means: Clouds of Bubbles, Undercharged</p>
ADD REFRIGERANT	Use the usual practice, same as the conventional optical sightglass.

Specifications

Weight: 22 ounces with batteries

Dimensions: 8 1/2" x 7" x 2"

Sensor cord length: 42 inches

Tubing capacity: 1 3/8" diameter

Warm-up time: Instantaneous

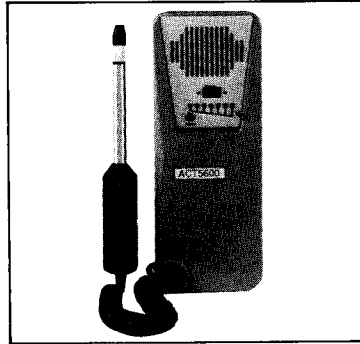
Response time: Instantaneous

Power supply: 4 AA batteries

Battery: 30 hours continuous
operation

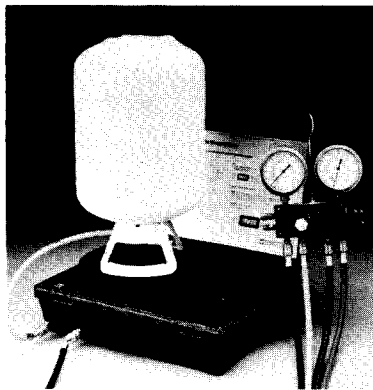
Operating Temperature: 32°F to 105°F

OTHER SNAP-ON PRODUCTS



The ACT5600 Automatic Halogen Leak Detector w/Visual Leak Size Indicator is equipped with two new features. The Visual Leak Size Indicator, consisting of 7 high-brightness LEDs, begins to light up as you approach the leak. The more LEDs on, the larger the leak! The Reset Switch makes leak detection very precise and efficient.

Ask for a new ACT5600



The ACT9000A Automatic Charging Meter is a new tool for automatically dispensing a preset amount of refrigerant into a system, in fractions of an ounce, from a standard cylinder up to 60 lbs. (Gauges not included).

Ask for a ACT9000A

Limited Warranty and Exchange/Repair Policy

This instrument is designed and produced to provide unlimited service. Should it become inoperative after performing the recommended maintenance, a no-charge repair or replacement will be made to the original owner within one year of the date of purchase. This applies to all repairable units which have not been tampered with or damaged. This warranty does not cover consumable items such as batteries, tips and fuses, nor physical damage and normal wear to components such as probes, sensors and adaptors. For repair service, send your tool to the factory address on the back of the Owner's Manual. Repaired or replaced tools will carry a 90-day warranty.

PM050SOT 4/90 Printed in U.S.A.