SAAB

9000

SERVICE MANUAL

Preliminary Issue

1:4 ISAT

Introduction to ISAT

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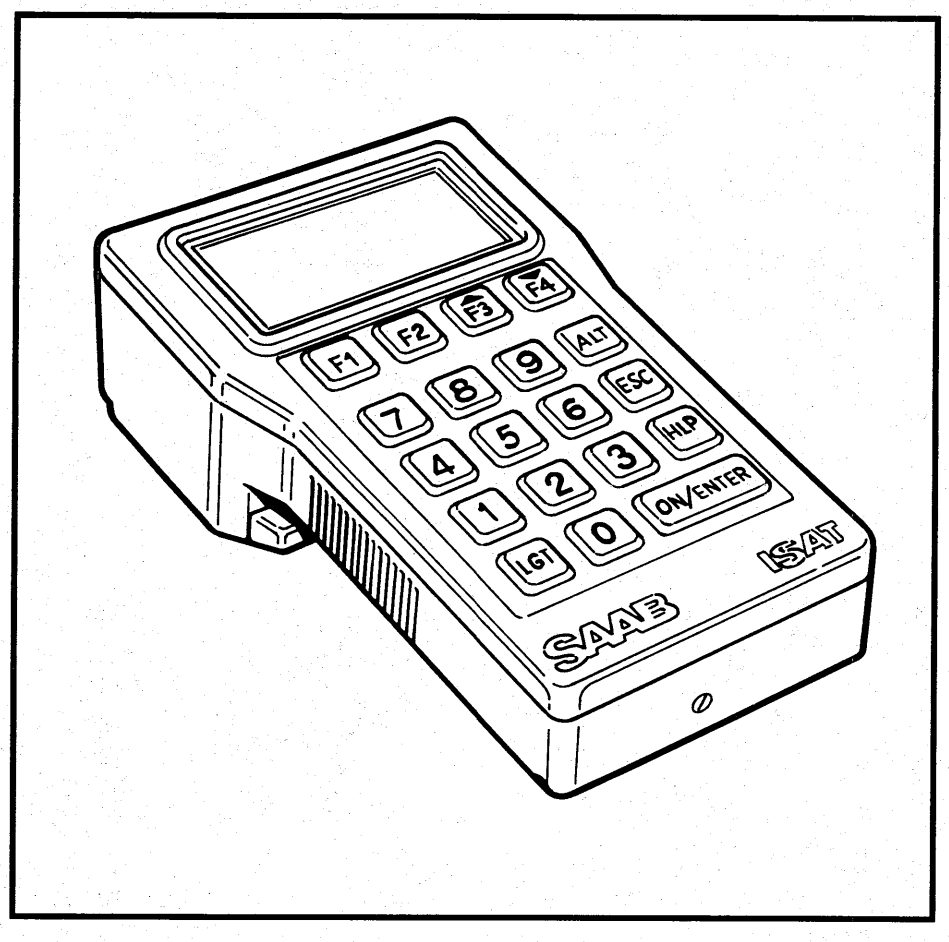


Saab-Scania are proud to present the **I**ntelligent **SA**ab **T**ester **(ISAT).**

ISAT is a multi-functional testing and measuring instrument with built-in versatility which can be used in a very wide range of applications on both current and future electrical and electronic systems.

The ISAT tester is built into a black polyamide plastic casing. It is designed for use in workshop environment and is resistant to oil, petrol, acid, impact etc.

It has a Liquid Crystal Display which comprises four lines of 20 dot matrix characters.

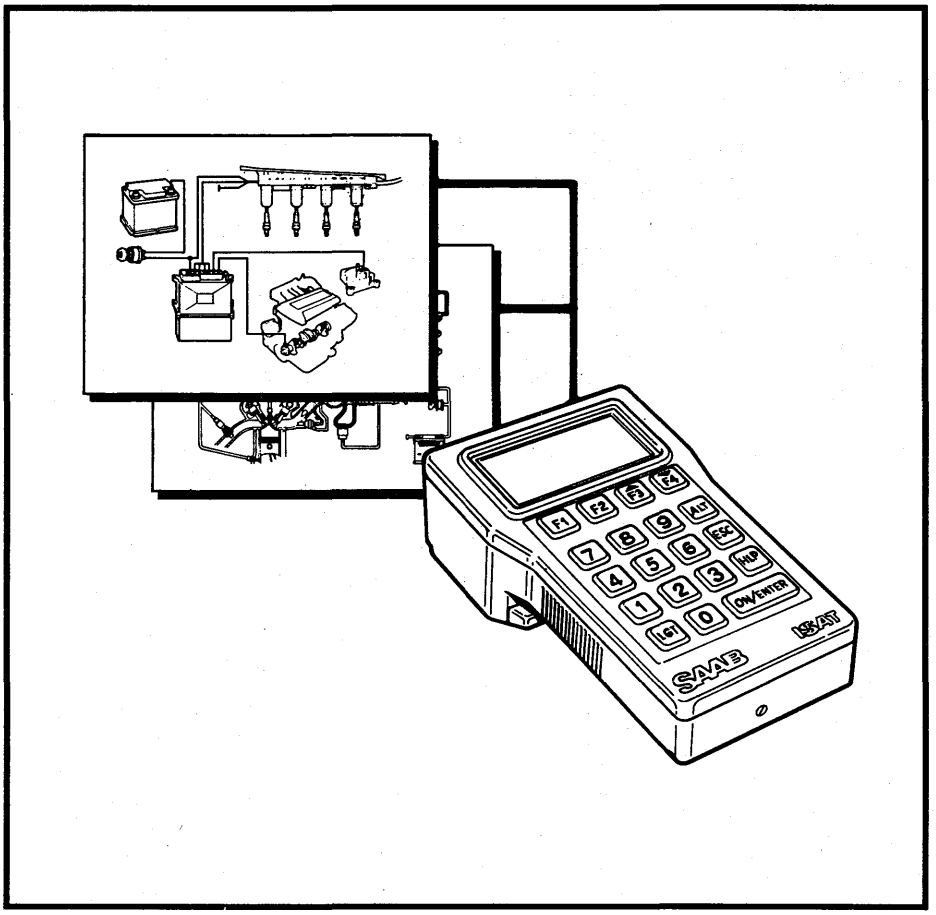
The key pad consists of 19 translucent rubber push buttons keys which can be back-lit.

The ISAT uses a Motorola 68HC11 processor and has two memories for storing data, a working memory for temporary storage and a permanent memory for long term storage of data. Together they have a capacity to store up to 1,000 measured values.

The controlling program is contained in an EPROM mounted on a plug-in printed circuit board, which is located together with the 9 Volt battery and display angle adjustment screw behind a cover in the base.

Introduction to ISAT

Diagnostic Ability

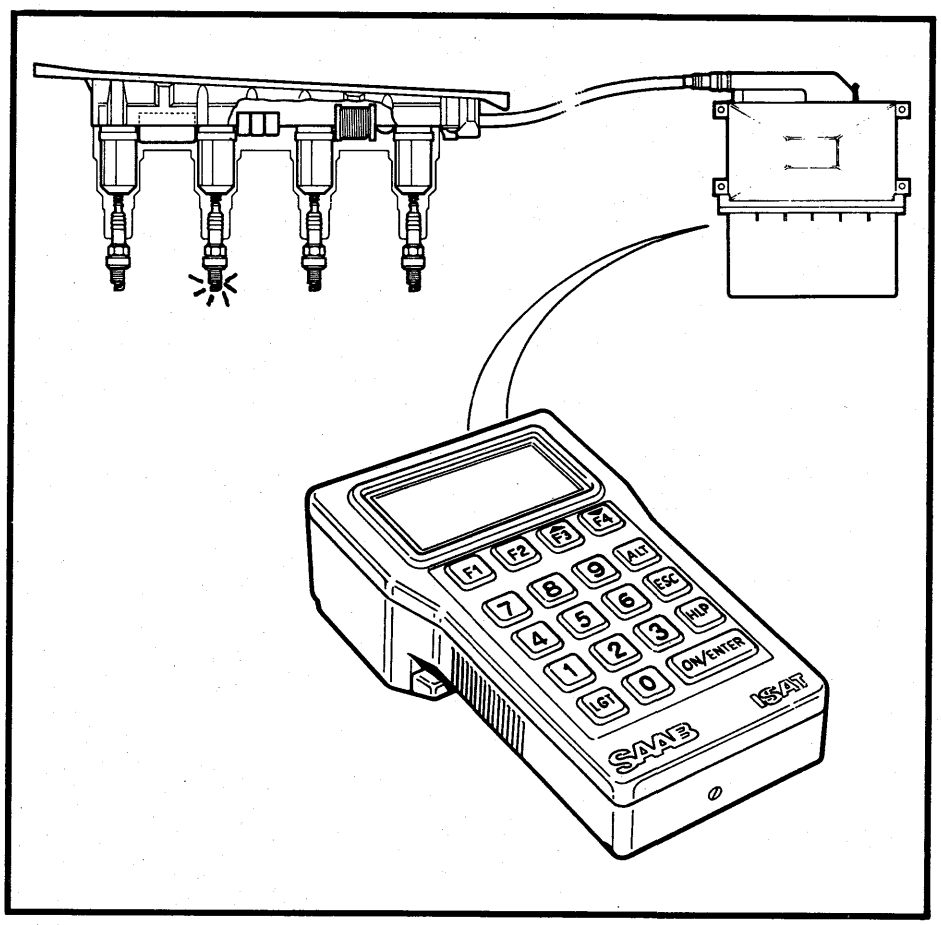


ISAT has been primarily designed for diagnosing faults occuring in electronic systems incorporating self-diagnosis functions, such as the Direct Ignition system.

These systems identify faults occuring during their operation and store information concerning such faults in the electronic control unit's memory.

The ISAT taps directly into the electronic control unit of such systems and displays the faults as a five digit code

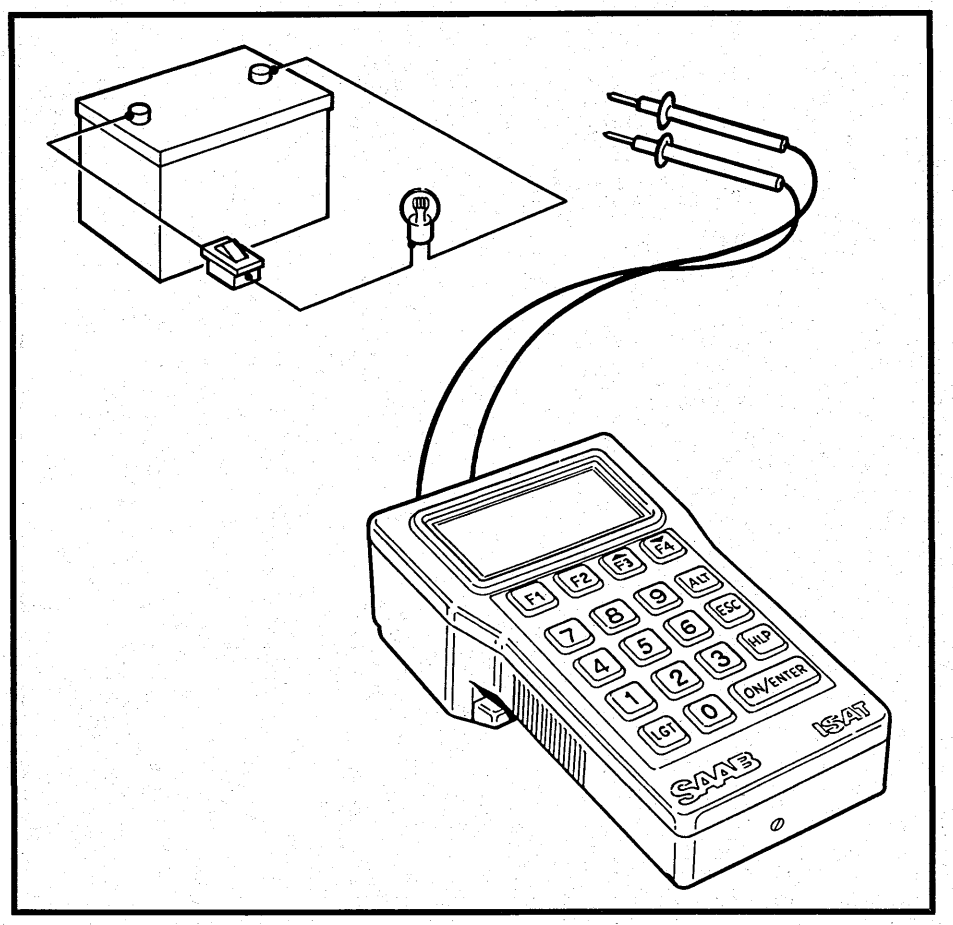
The diagnostic function of ISAT will only function on systems with ECU's that have been prepared to communicate with ISAT. For 1990 ISAT will communicate with the LH fuel system, the DI/APC system, the EDU and the ACC. ISAT's multimeter, measuring and TSI functions may be used on any SAAB.



By using the key pad, the ISAT can be used to issue commands to the electronic control units of systems being tested to control selected functions, such as operating switches, activating injectors etc.

Introduction to ISAT

Multimeter Functions



The ISAT is capable of performing all the functions of a multimeter, measuring Voltage, Current and Resistance.

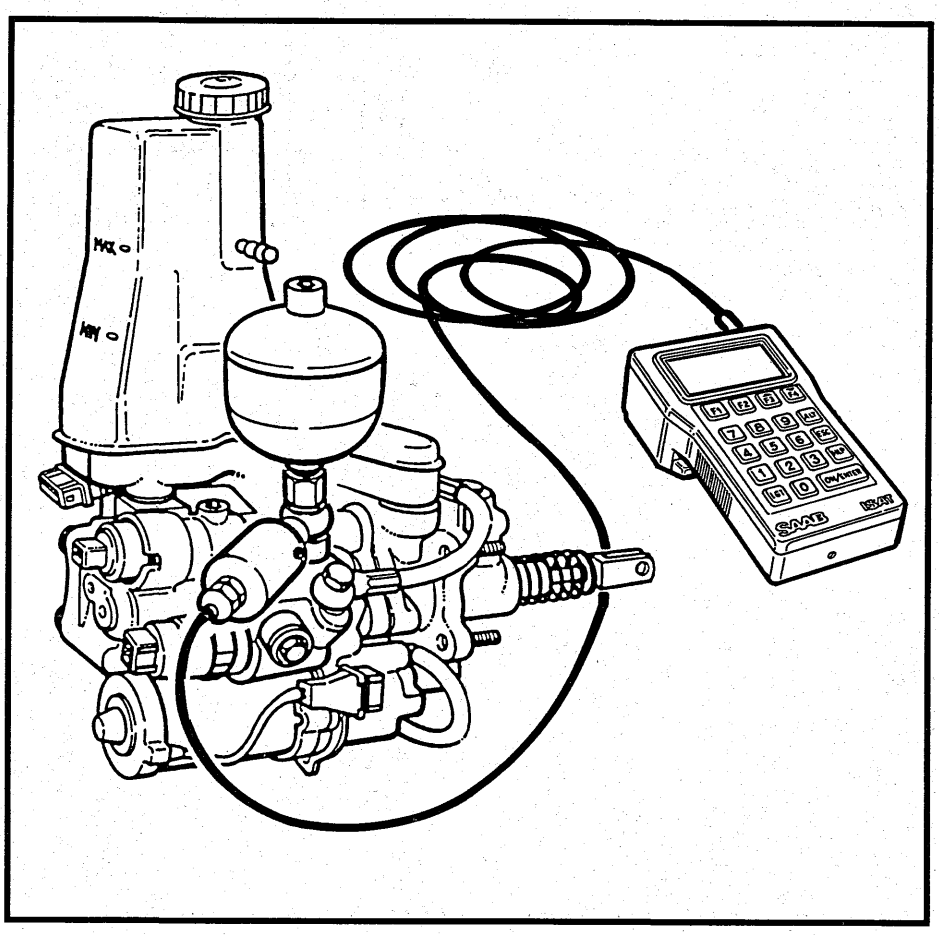
Voltage
Measuring Range: -126 to +126 V d.c.
Accuracy: Better than 1%

Current
Measuring Range: -10 to +10 A d.c.
(10 to 600 A with inductive proximity tester)
Accuracy: Better than 1%

Resistance
Measuring Range: 0 to 256 Kohm
Accuracy: Better than 0.5%

Introduction to ISAT

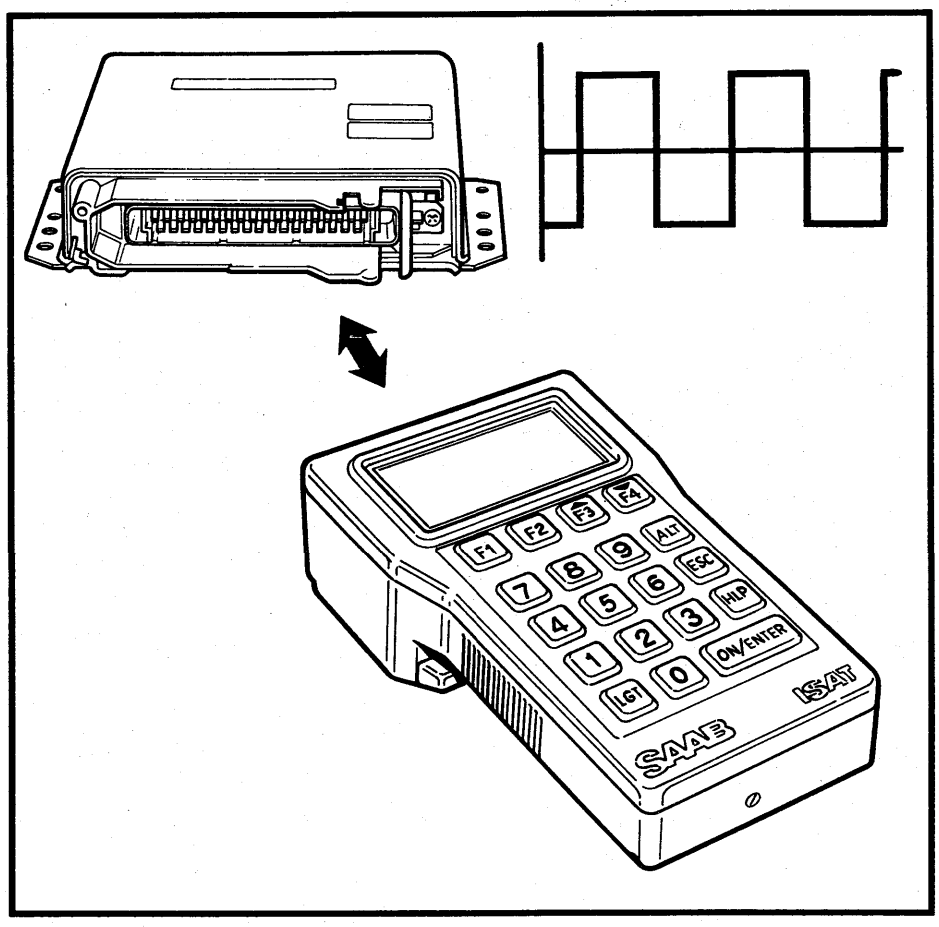
Pressure Measurement Function



By using suitable pressure sensors, the ISAT can be used as a pressure tester, with a range of 0 - 200 Bar (0 - 2900 psi)

Introduction to ISAT

Frequency Measurement Function



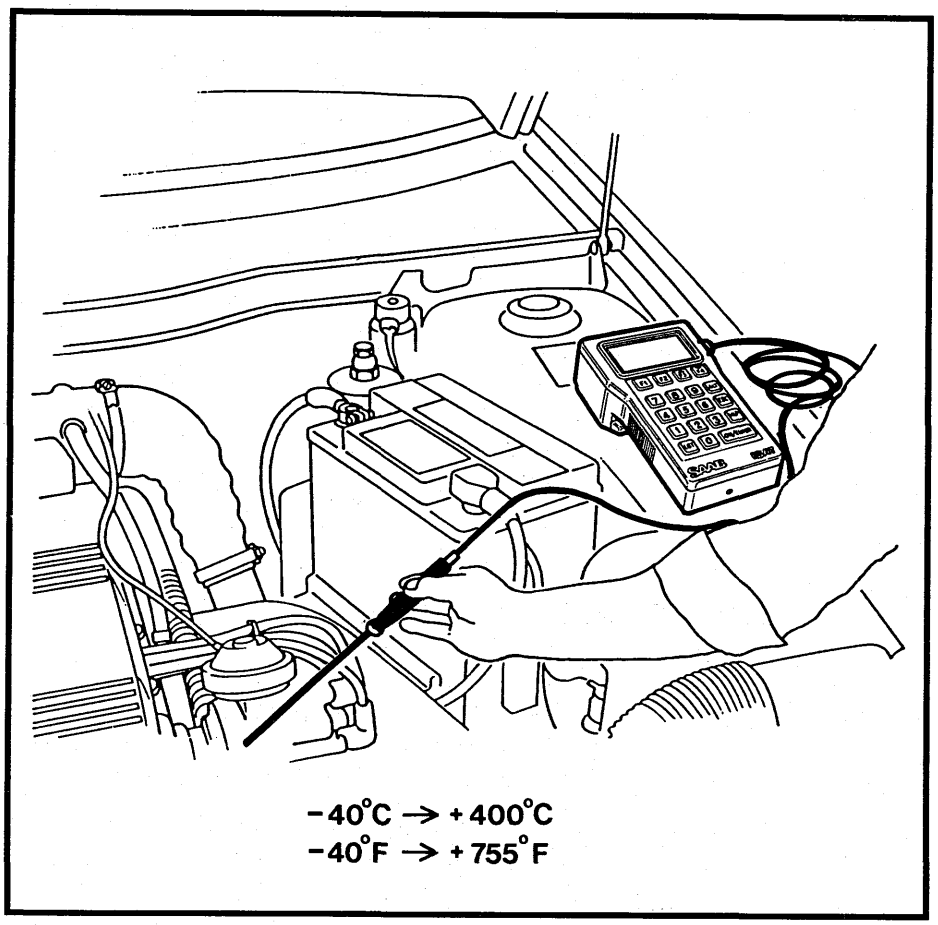
The ISAT can be used to measure frequency and pulse length.

Range: 1 Hz to 10 KHz (Approximately)
Time: 13 Microseconds minimum

Applications: Injector duration, APC solenoid, and other digital "pulsed" signals.

Introduction to ISAT

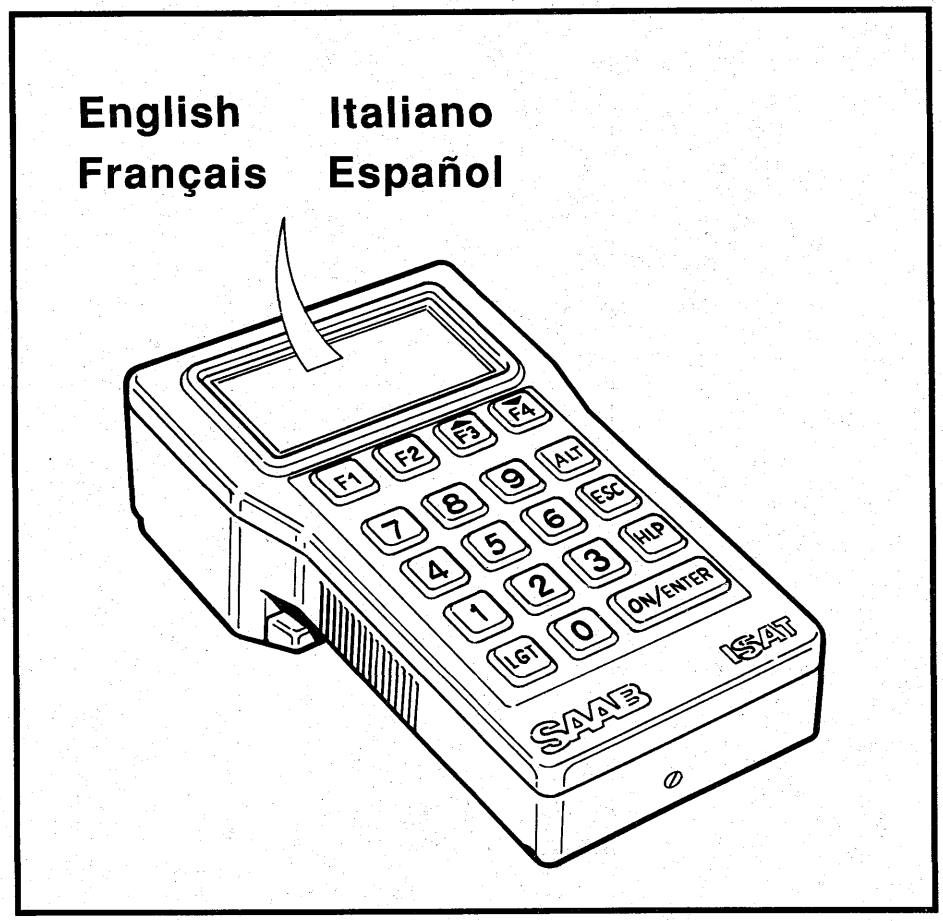
Temperature Measurement Function



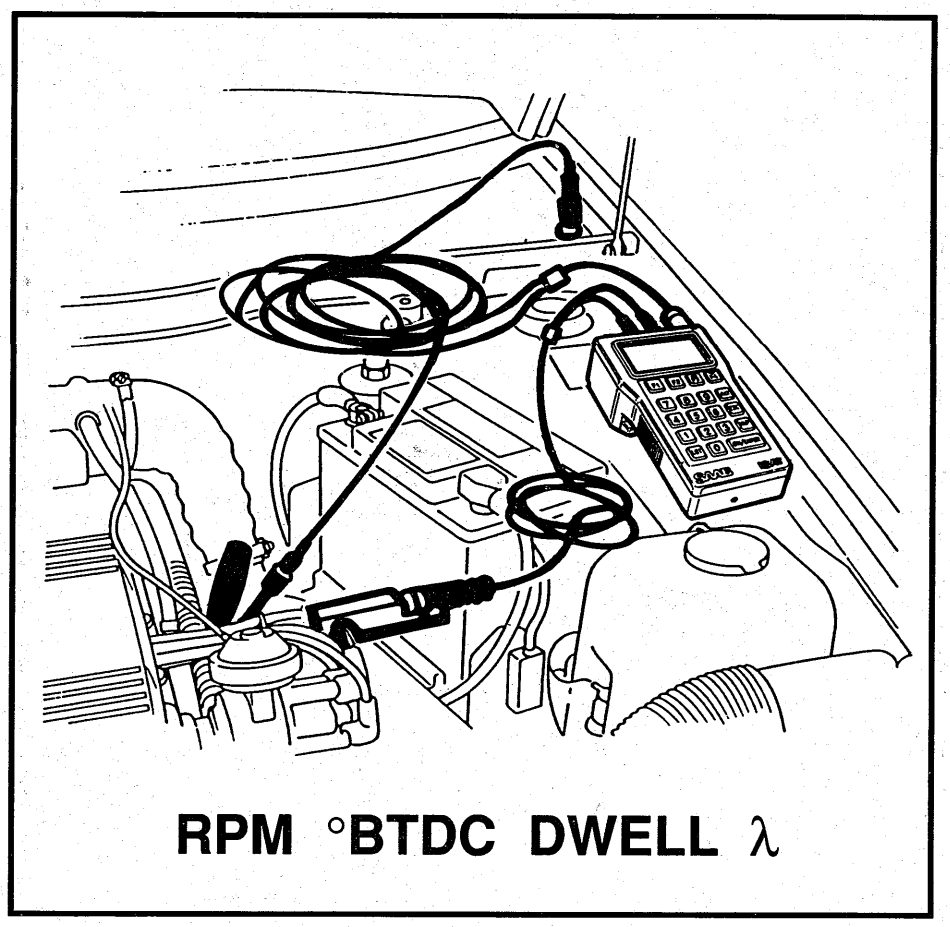
-40°C → +400°C
-40°F → +755°F

By using a suitable temperature sensor, the ISAT can be used as a thermometer, with a range of -40°C to +400°C (-40°F to +755°F)

The temperature probe is an accessory tool that is not supplied with the basic ISAT unit.



The ISAT is multi-lingual and is capable of displaying information in any one of four languages: English, Spanish, French or Italian.

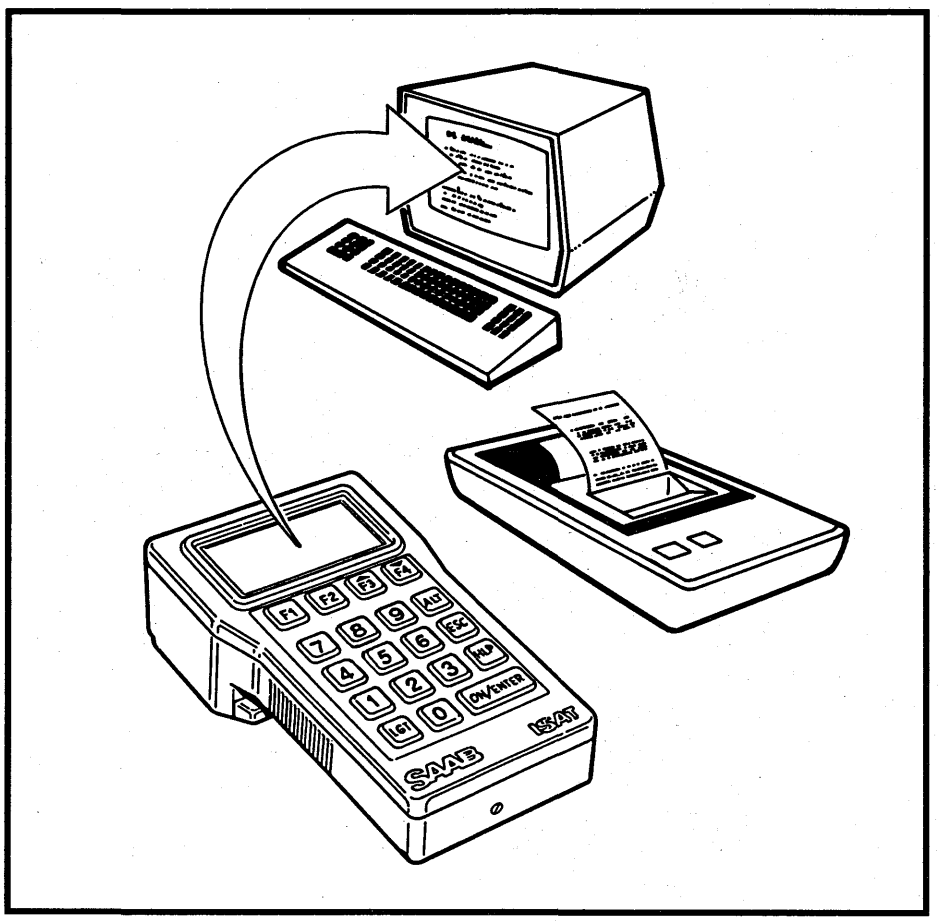


By using a suitable TSI lead set, the ISAT can be used in place of the TSI instrument

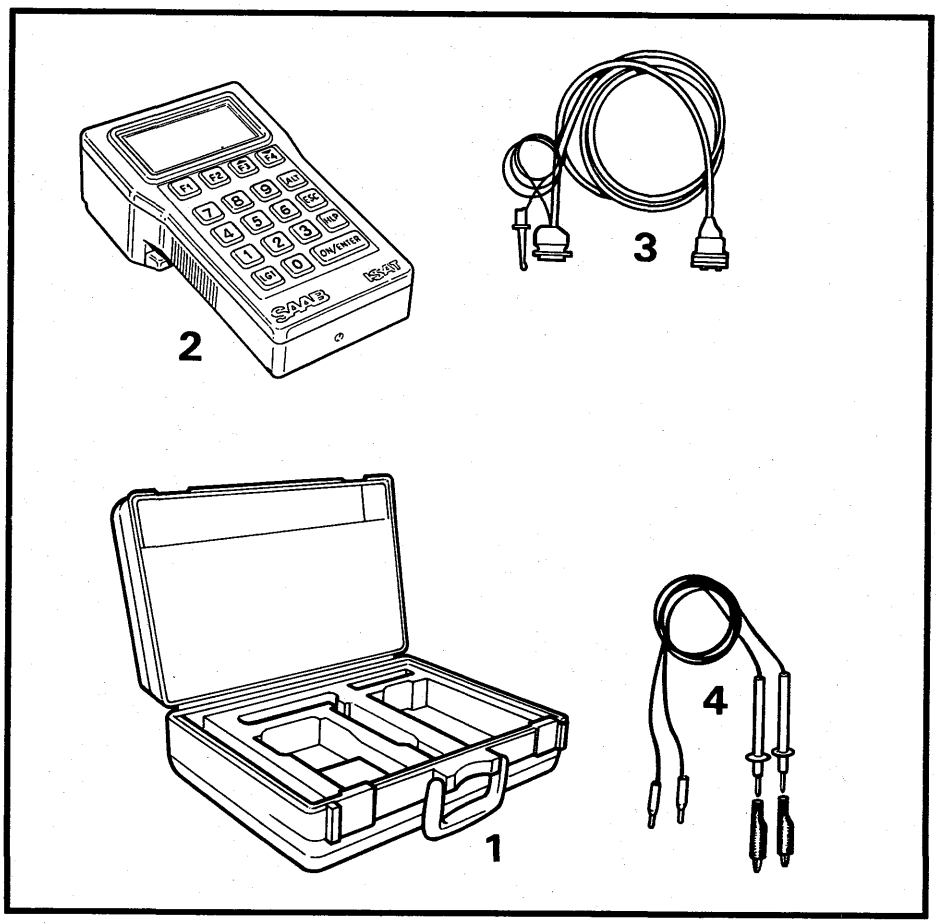
The availability of the accessory TSI cable will be announced at a later date.

Introduction to ISAT

Personal Computer (PC) Compatibility



The ISAT has been developed to permit the expansion of its capabilities in the future. For example, by using an interface cable, the ISAT will be able to be connected to a personal computer or printer. Data collected by the ISAT can then be compared with reference values, results can be printed out or data may be transferred for storage. It will also be possible to control the ISAT from a PC.



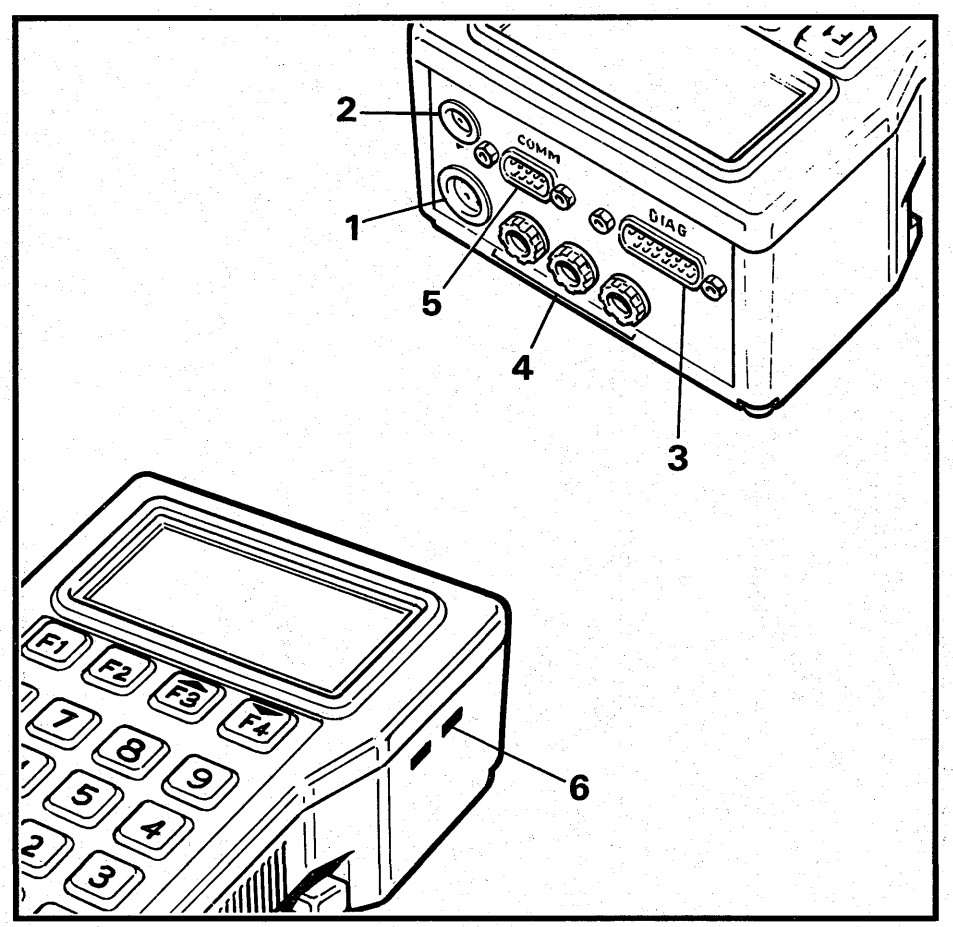
The ISAT is supplied complete with the following basic items:

1 Storage/carrying case

2 ISAT instrument complete with:
Rechargeable 9 Volt battery
Exchangeable Program Board

3 10 pin diagnosis lead set

4 Multimeter test lead set



There are 6 sets of interface connection ports:

1 TSI (5 Pin Socket)

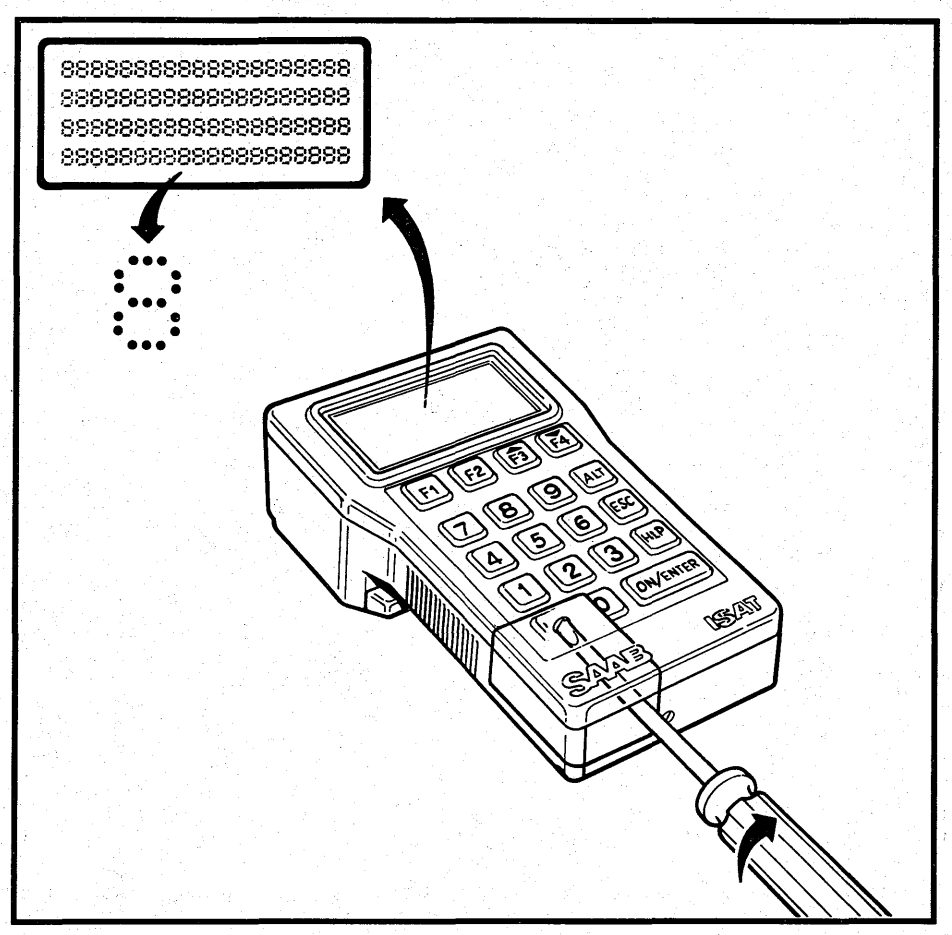
2 Pressure (4 Pin Socket)

3 System diagnosis (Standard D-15 connector)

4 Digital Multimeter Ports and Ports for pulse/ frequency measurement

5 Computer interface(Standard D-9 connector)

6 Temperature measurement probe

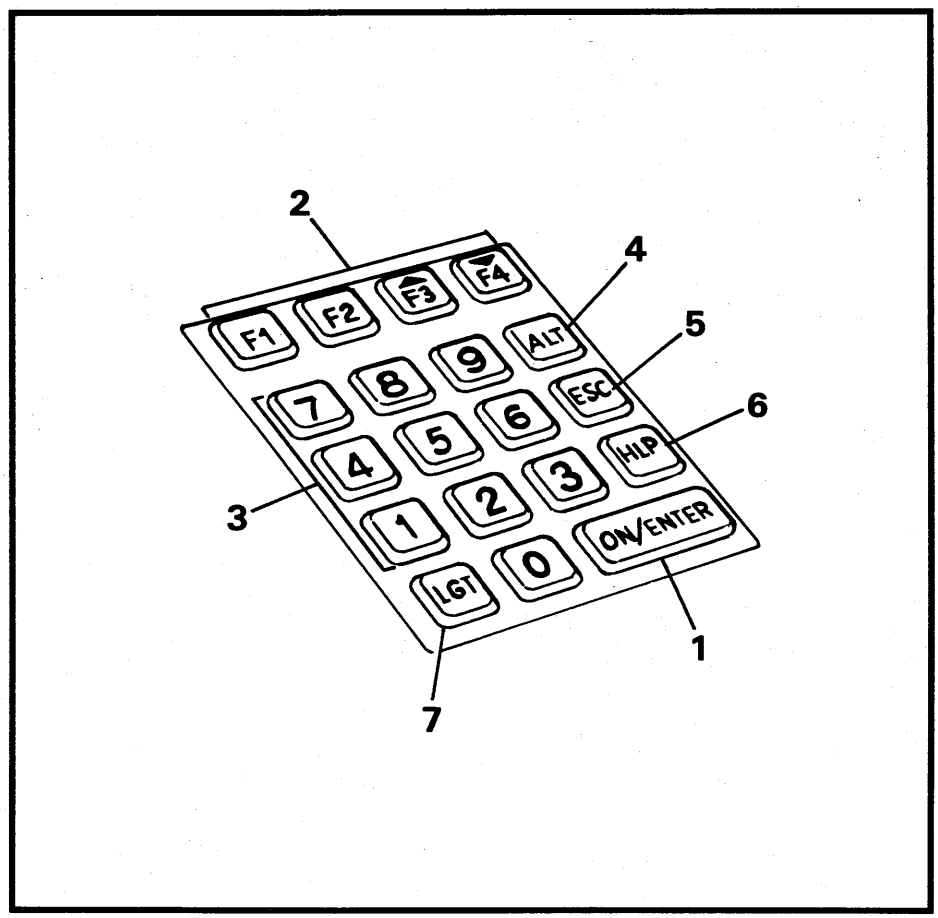


The display consists of a dot matrix of LCDs comprising 4 lines each with 20 characters per line. Each character is formed from a fixed matrix of 5 X 7 Dots.

The background colour is green.

The angle of display can be adjusted to suit the position during use by turning the adjusting screw.

Keypad



The key pad is designed for use in workshop environment. It is strong and is resistant to oil, dirt and acid.

It contains 19 translucent rubber keys which can be lit from behind if required.

The ON/ENTER key (1) is used to switch the tester on and also to execute any commands that are entered via the keys.

The F1, F2, F3 and F4 keys (2) are function keys. These are used to select functions from the menu. Keys F3 and F4 are also used to scroll up or down the display.

The keys numbered 0 - 9 (3) are used to input data into the tester.

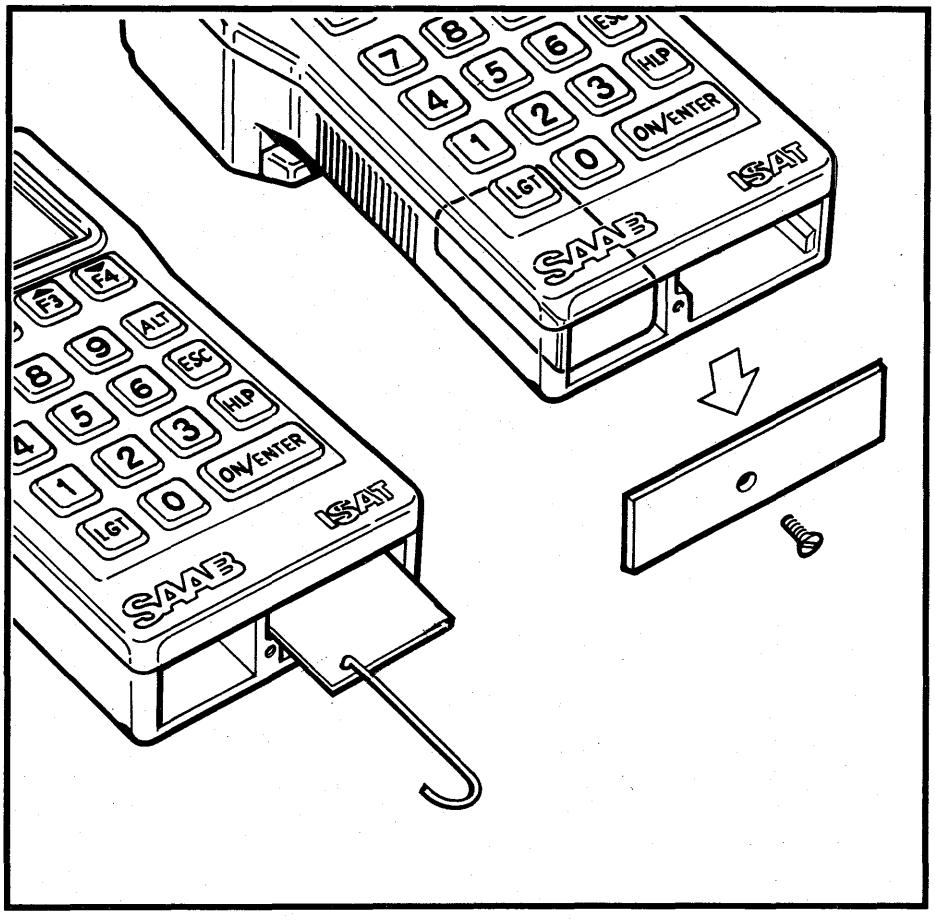
The ALT key (4) enables the function keys to be used to select further functions.

The ESC key (5) is an escape key which enables the operator to abort the current function

The HLP key (6) enables the operator to call up additional HELP information

The LGT key (7) enables the backlighting to be switched on and off.

Changing The Battery Or Program Board



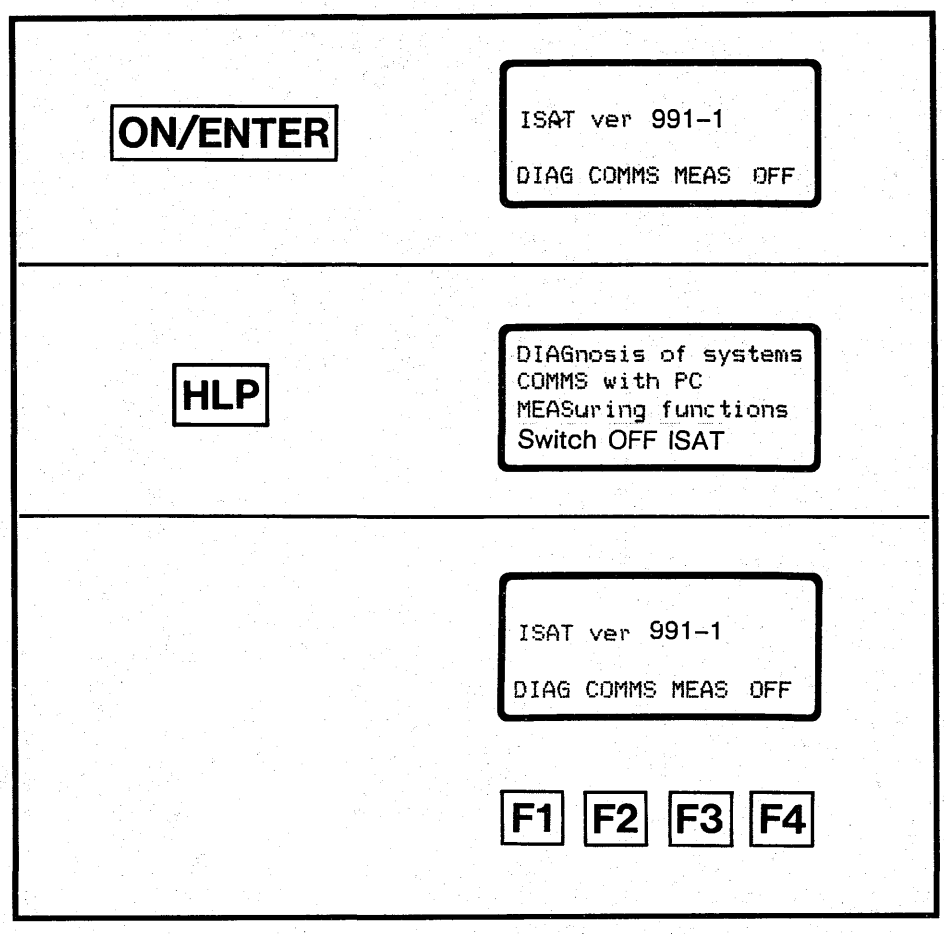
The battery and control program board are located behind the cover. To replace either item, first remove the cover.

To replace the battery, take out the old battery, disconnect it and fit a new battery.

A rechargeable battery is fitted. When the tester is connected to the car, the car's battery supply recharges the instrument's battery.

WARNING!
Use only a rechargeable Nickle-Cadmium (Ni-Cad) battery. Use of a standard alkaline battery may damage the tester.

To replace a control program board, place a piece of hooked wire through the holes in the leading edge of the board and pull it out. Do not force or bend the board. Slide in the new board.



To switch on the tester, press the ON/ENTER key. The display will show the version of tester (hardware) and programmes (software) that is in use. If either the tester or the programmes are updated, the display will automatically show the upgraded version.

At the same time, the display will show the main menu screen referred to in the following text as a menu "page".

To select the diagnostic menu (DIAG), press key F1.

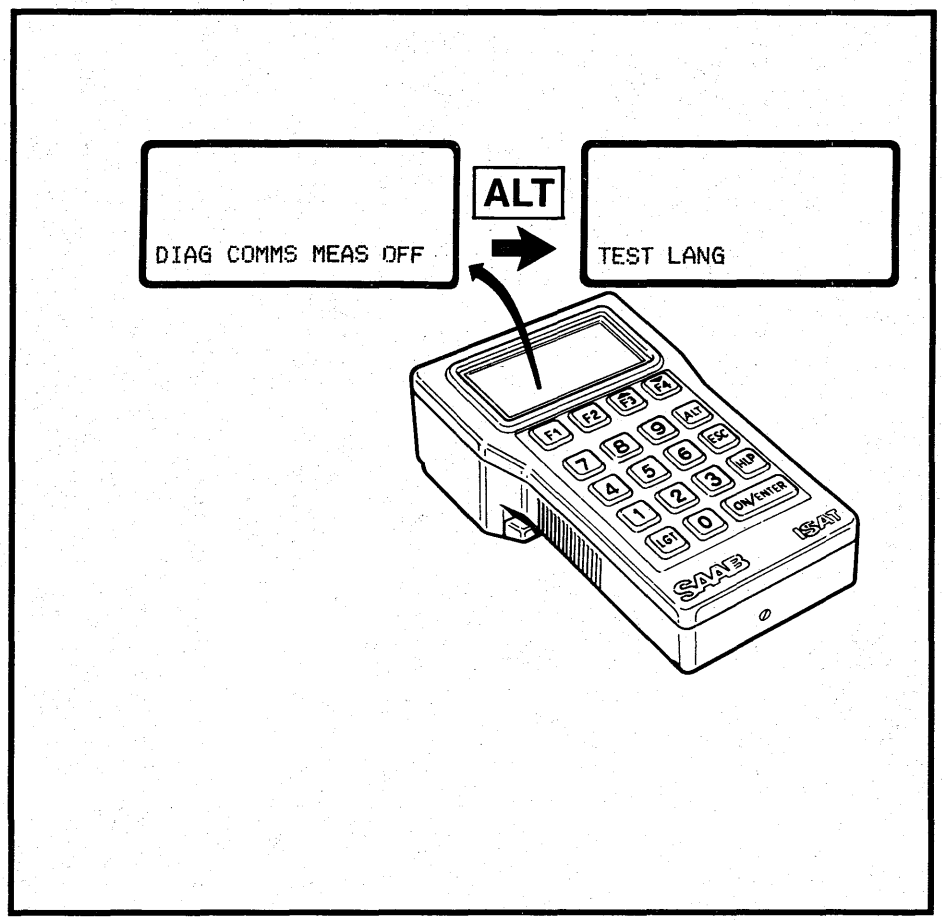
To select the communications menu (COMMS), press key F2.

To select the measurement menu (MEAS), press key F3.

To turn the tester off (OFF), press key F4.

If any button on the tester has not been pressed during an 8 minute interval, the tester automatically switches off. It will return to the selected mode as soon as ON/ENTER is pressed.

Use Of Alt Key



The ALT key is used to call up the next page of the same level of the selected menu in order to select further functions.

If there are no further pages, the display will return to the previous menu page at the same level when the ALT key is pressed.

If the ALT key is pressed after the tester is switched on, the second page of the main menu is displayed.

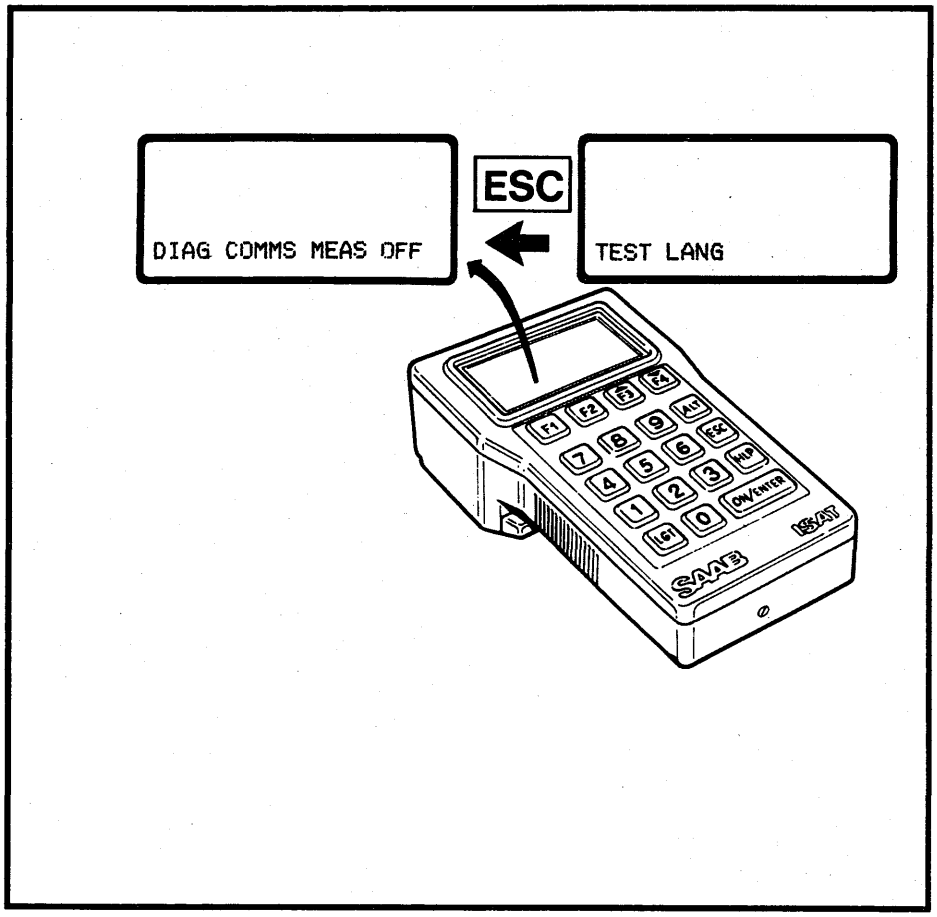
Pressing the HLP key shows that:

The TEST function which is selected by pressing key F1 inaugurates a self test mode in which the tester checks its own basic functions.

The TEST function will also display the serial number of the ISAT tester.

The LANG function is selected by pressing key F2 and enables you to select one of the four languages.

Use Of ESC Key

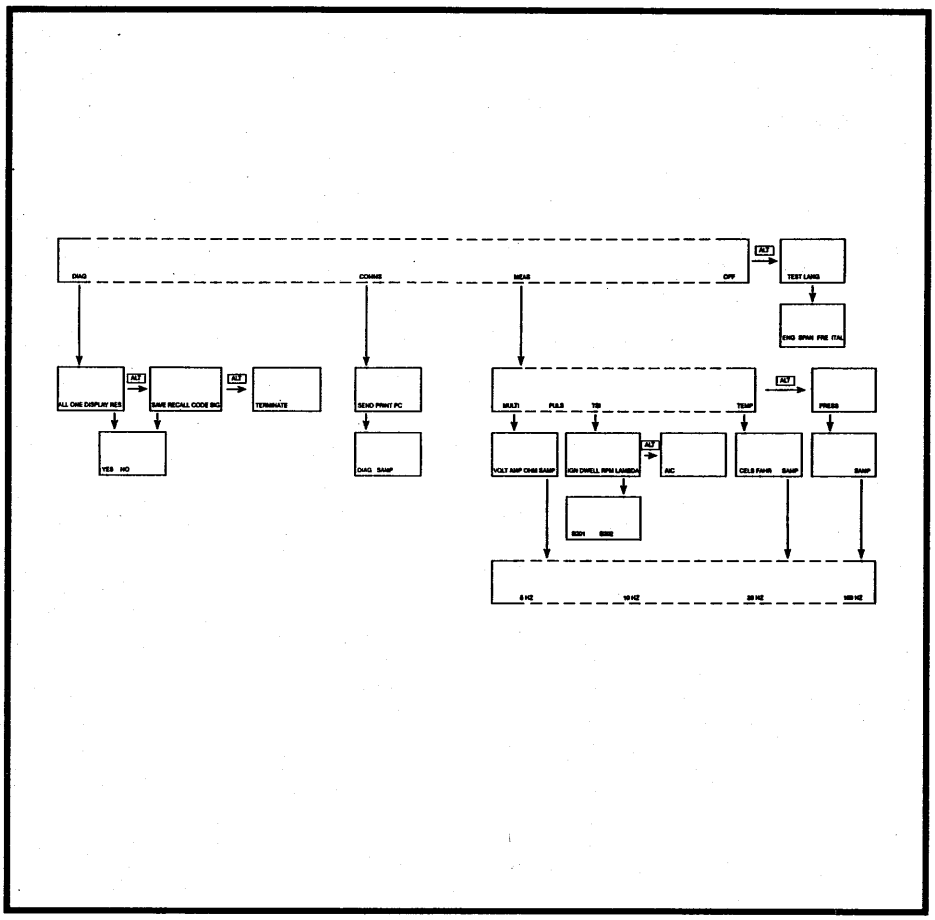


If the ESC key is pressed, the display shows the previously selected page.

If the second page of the main menu is displayed, pressing the ESC key will cause the first page on the main menu to be displayed.

Introduction to ISAT

Menu Flow Chart



The control and selection of functions in the ISAT tester is programmed as a logical branching menu system, like the root system of a tree, each root or sub-menu of which controls a specific family of functions.

Selection of individual functions is achieved by moving about the root system using the function keys.

A complete understanding of the menu and its logic is essential to the correct use of the tester.

The menu consists of two pages which provide six sub-menus each with several levels. Each level defines a selected function further.

The four roots of the first page of the main menu are:

DIAG - a system diagnosis sub-menu.

COMMS - a communications sub-menu.

MEAS - a measurement sub-menu.

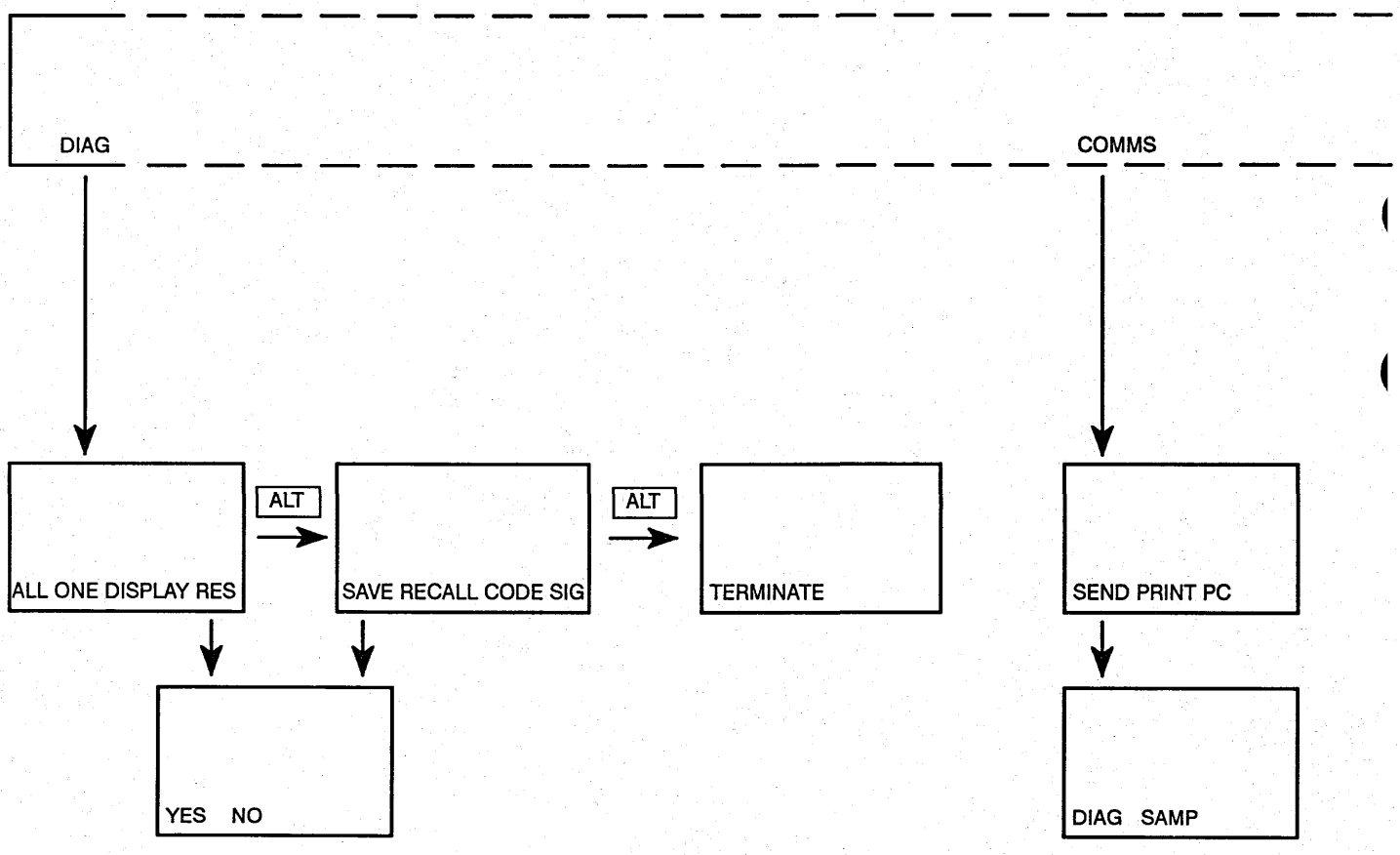
OFF - switches the tester off

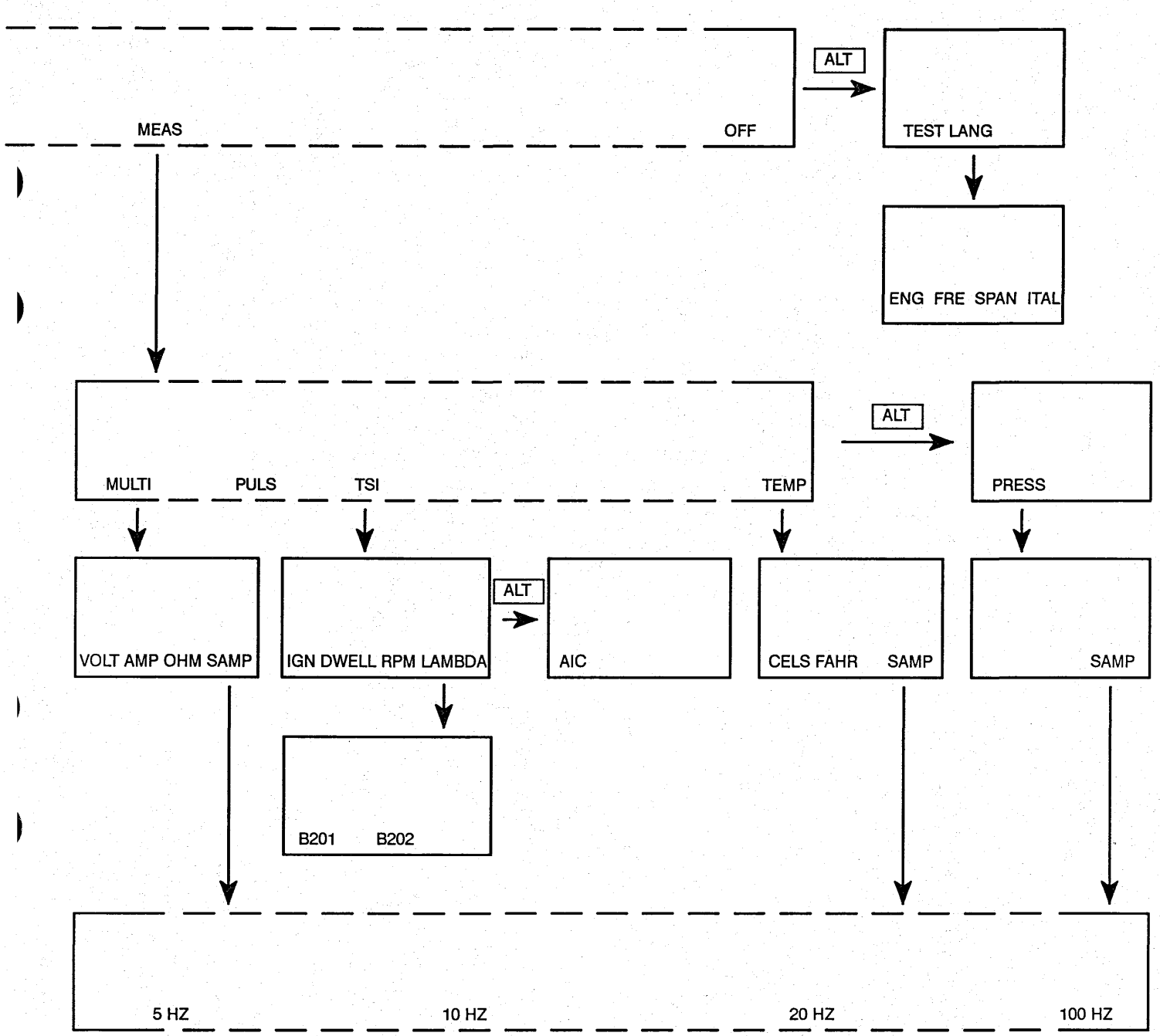
The two roots of the second page of the main menu are;

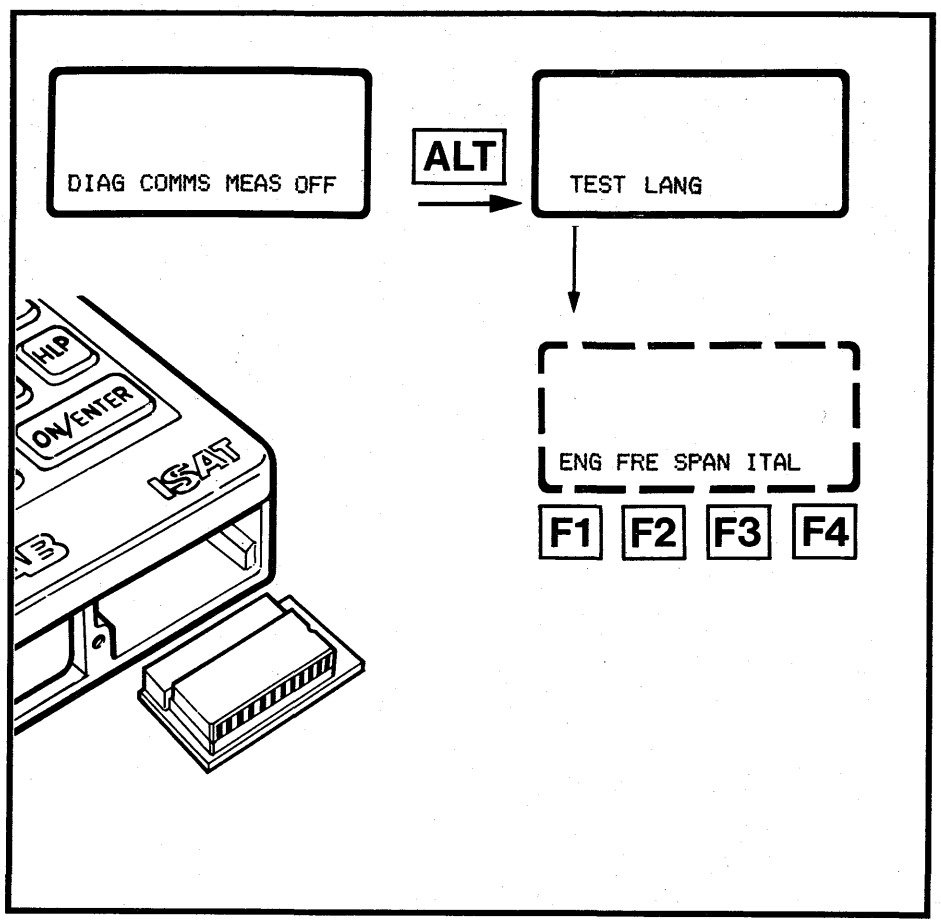
TEST - a self test function

LANG - a language selection menu.

Menu Flow Chart

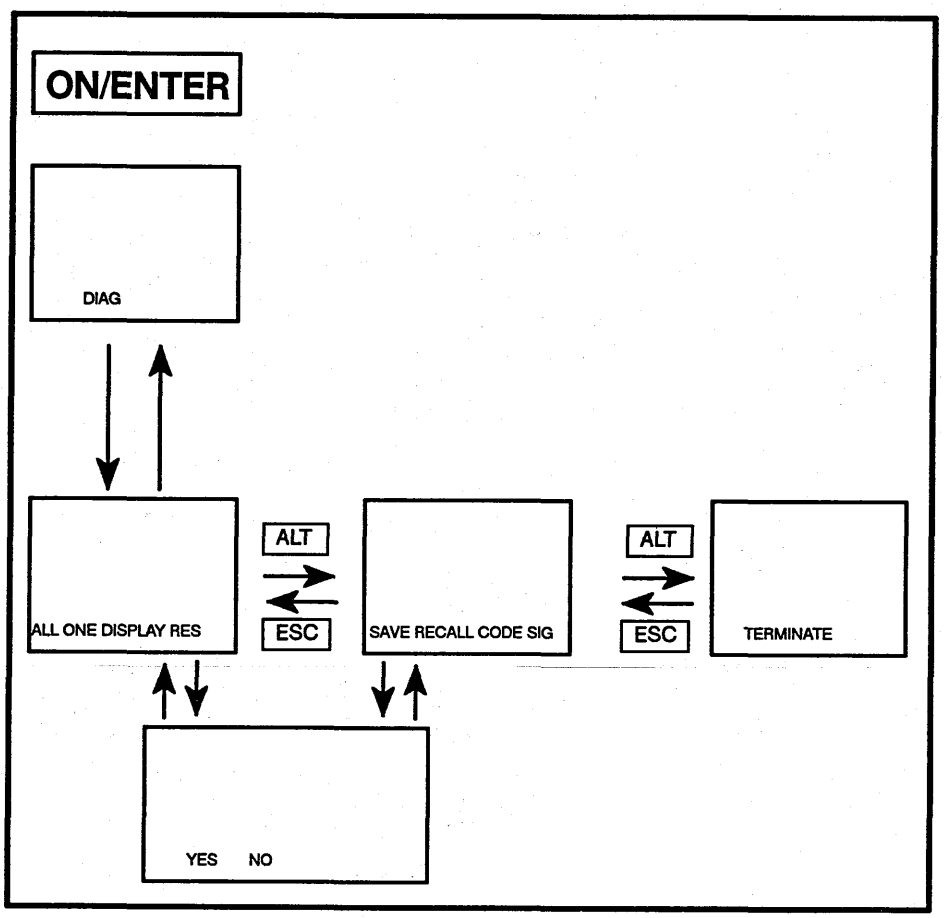



MEAS
OFF
ALT
TEST LANG
ENG FRE SPAN ITAL
MULTI
PULS
TSI
TEMP
ALT
PRESS
VOLT AMP OHM SAMP
IGN DWELL RPM LAMBDA
ALT
AIC
CELS FAHR SAMP
SAMP
B201 B202
5 HZ
10 HZ
20 HZ
100 HZ

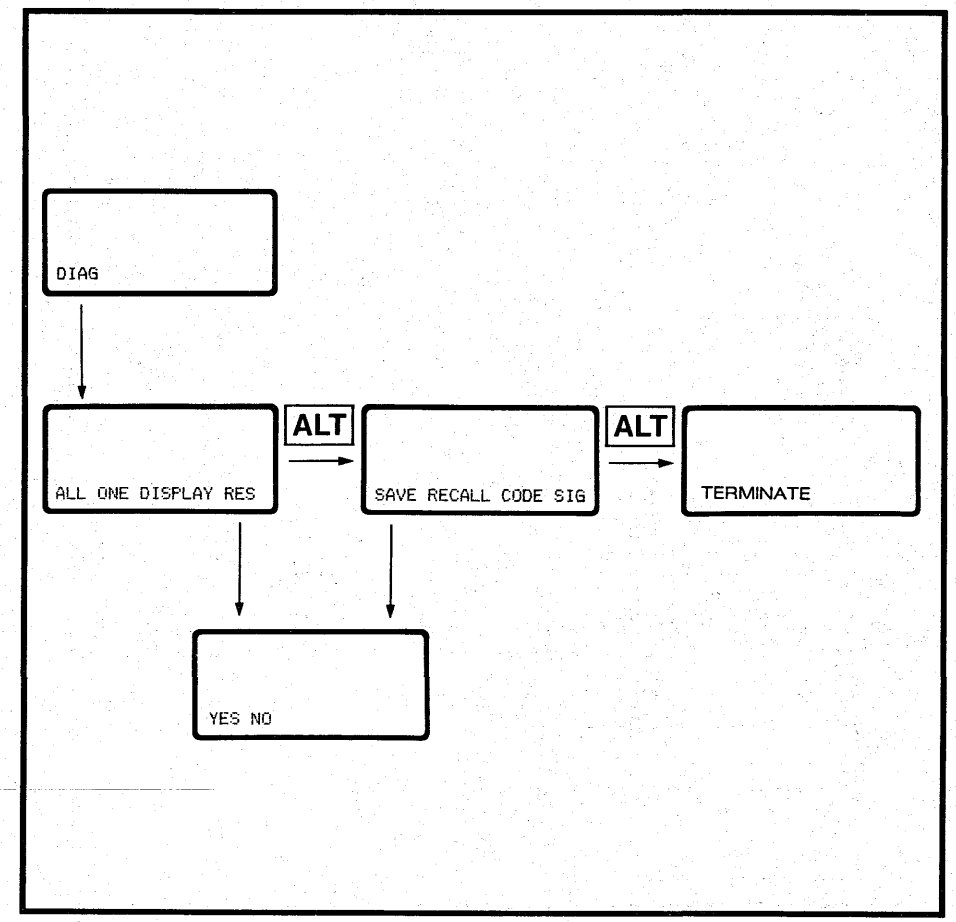


LANG is the language selection menu used to select the language of the display.

Functions within the menu enable the operator to select the appropriate display language.

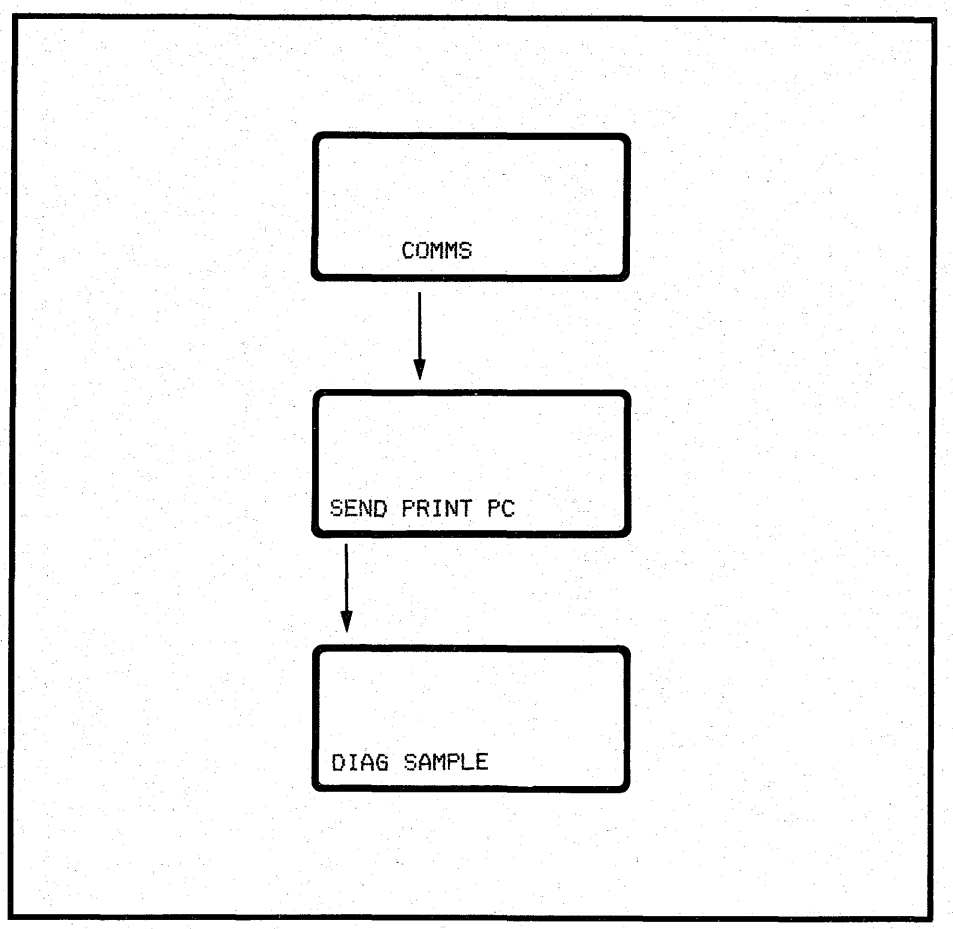


This diagram shows how ALT and ESC keys can be used to select and move about the DIAG menu.



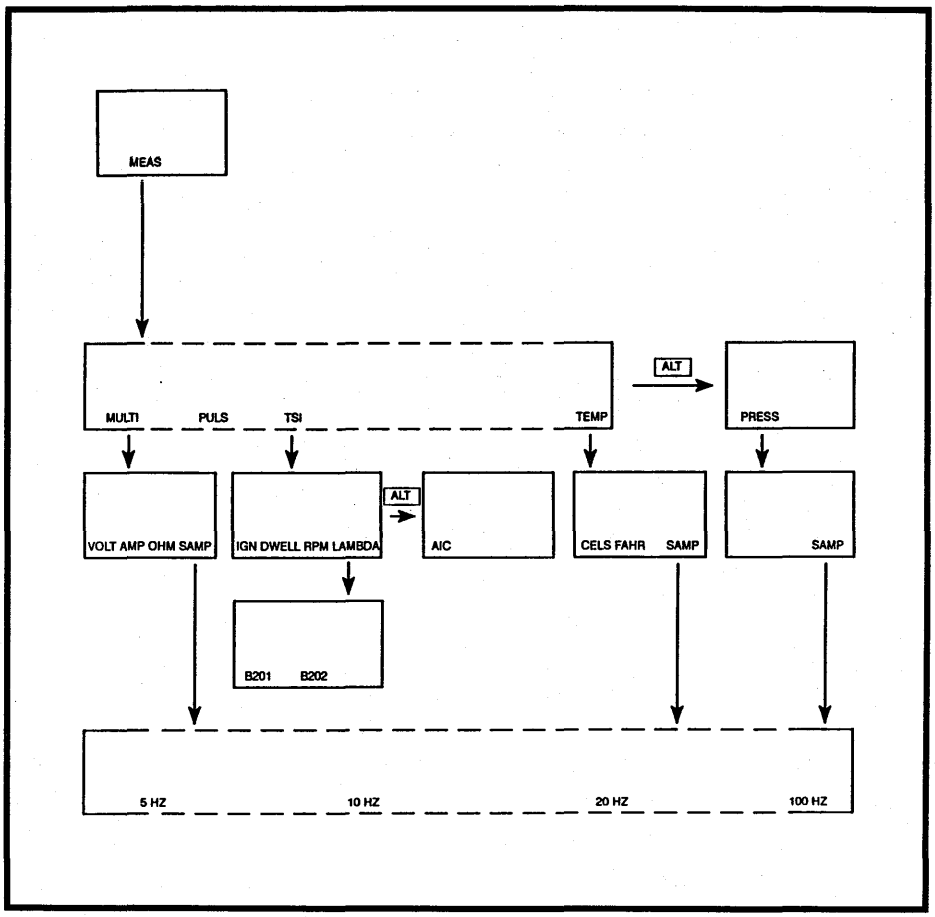
DIAG is the system diagnosis sub-menu. It contains all the functions used when testing systems fitted with intelligent electronic control units.

Functions within the menu enable the operator to select tests, display results, save information, recall information and issue commands



COMMS is the communications sub-menu which contains all the functions enabling the tester to communicate with other computerised equipment.

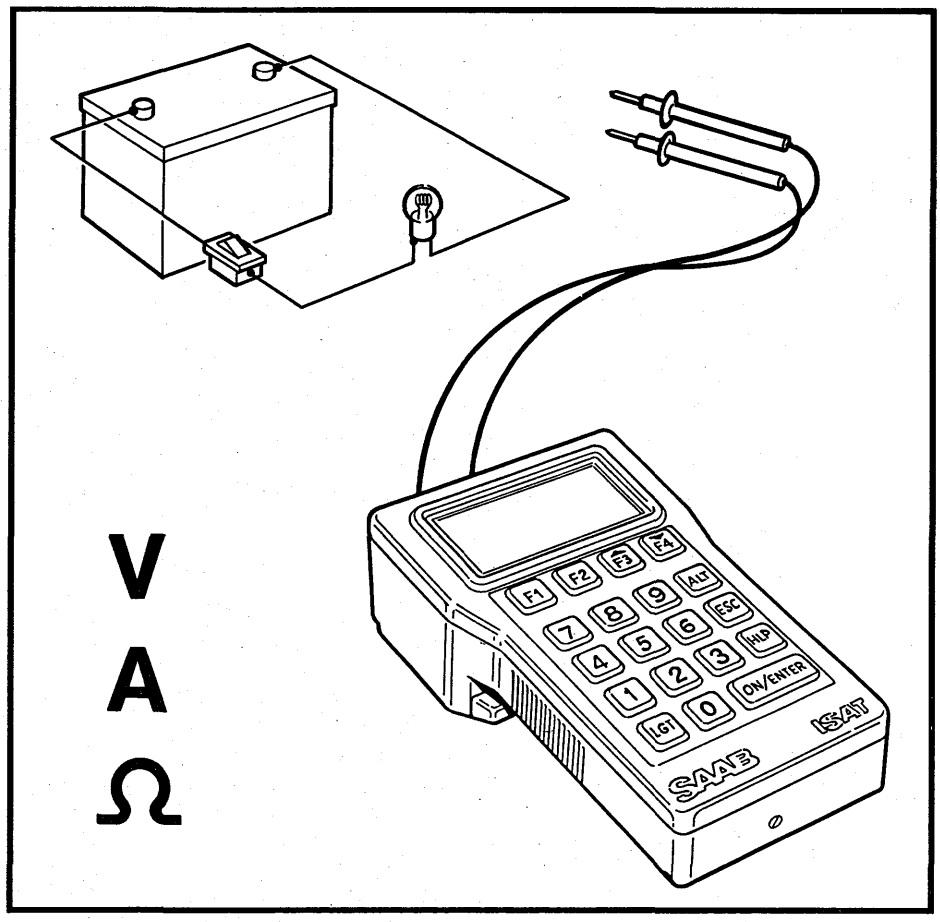
Functions within the menu enable the operator to send information, print results and use a personal computer to control the tester.



MEAS is the measurement sub-menu which contains all the functions for using the tester to measure values.

Functions within the menu enable the operator to select the type of measurement and the range of values

ISAT As A Multimeter



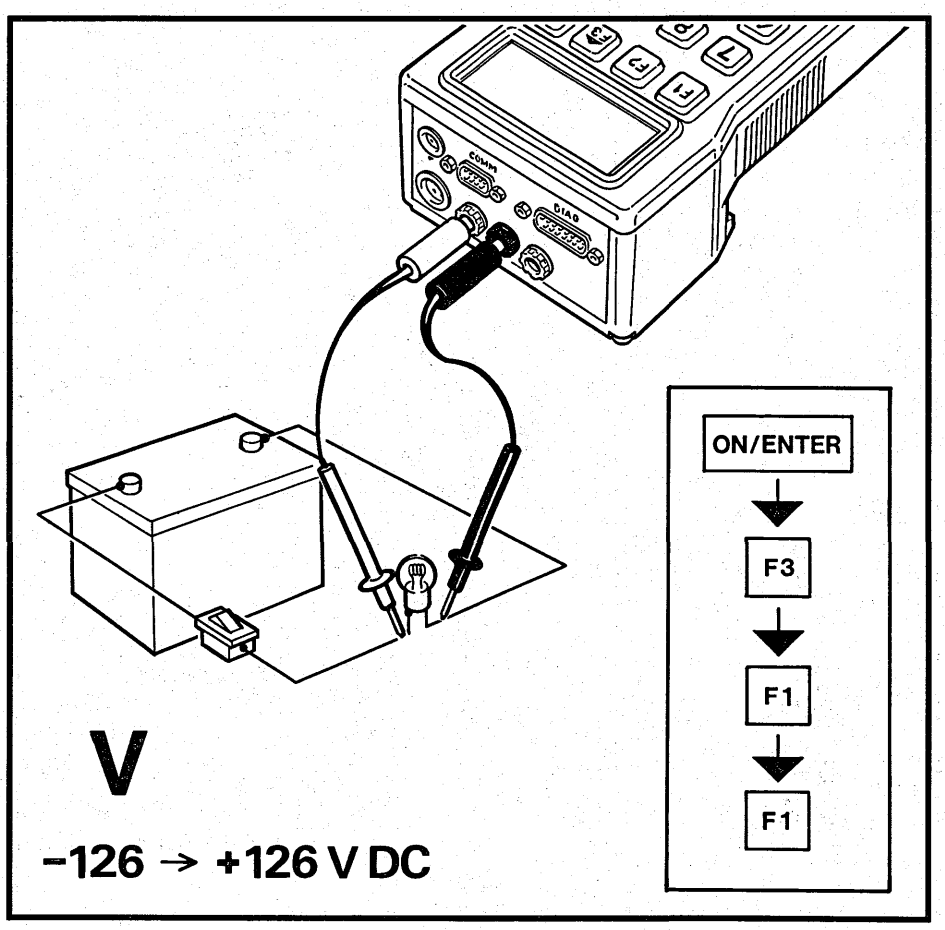
The ISAT tester can be used as a digital multimeter (DMM) to measure Voltage, Current and Resistance.

Voltage
Measuring Range: -126 to +126 V d.c.
Accuracy: Better than 1%

Current
Measuring Range: -10 to +10 A d.c.
(10 to 600 A with inductive proximity tester)
Accuracy: Better than 1%

Resistance
Measuring Range: 0 to 256 Kohm
Accuracy: Better than 0.5%

To use the multimeter functions, the correct test leads must be used. These are connected into the appropriate DMM ports according to test selected.

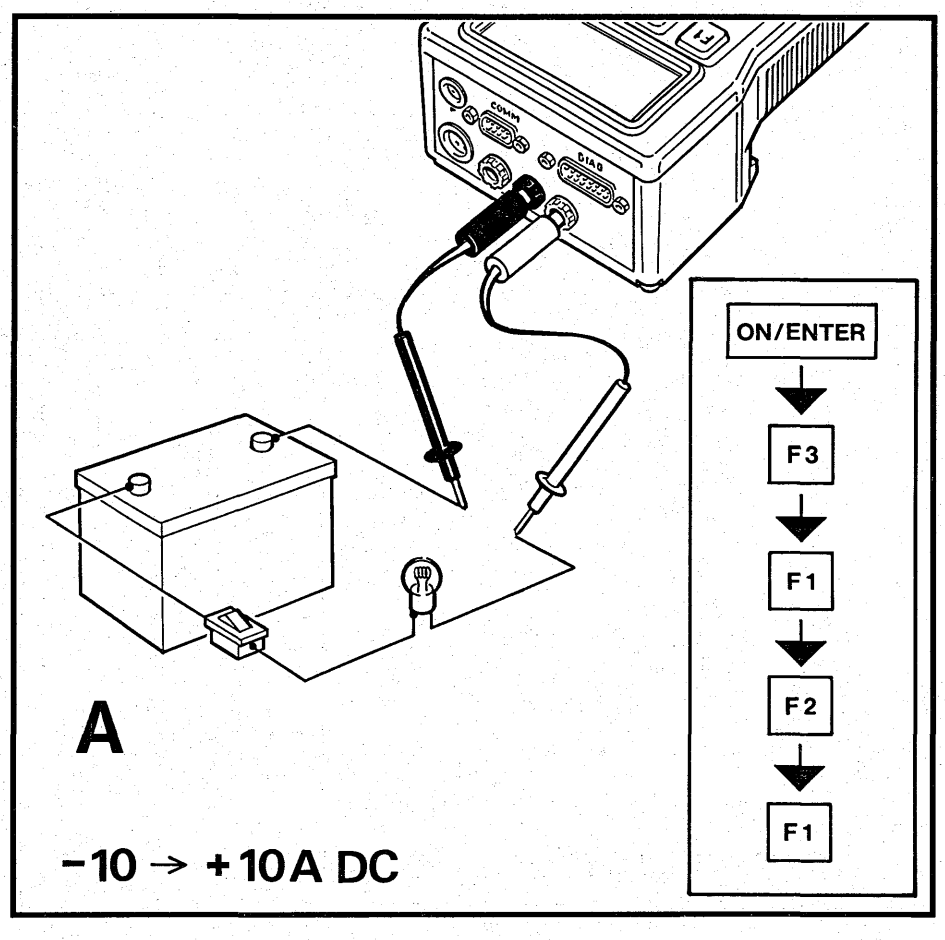


To use the ISAT as a voltmeter, connect the DMM test leads into the red and black ports.

Select the Voltmeter function by the following key sequence:
ON/ENTER, F3, F1, F1.

As a voltmeter, the ISAT tester has a range from -126 to +126 Volts D.C. with an accuracy better than 1%. The meter has an autoranging function which automatically selects the correct measuring range.

Ammeter (0–10) Amps) Function



To use the ISAT as an ammeter for current between -10 and 10 amps, connect the DMM test leads into the white and black ports.

Select the Ammeter function by the following key sequence:
ON/ENTER, F3, F1, F2, F1.

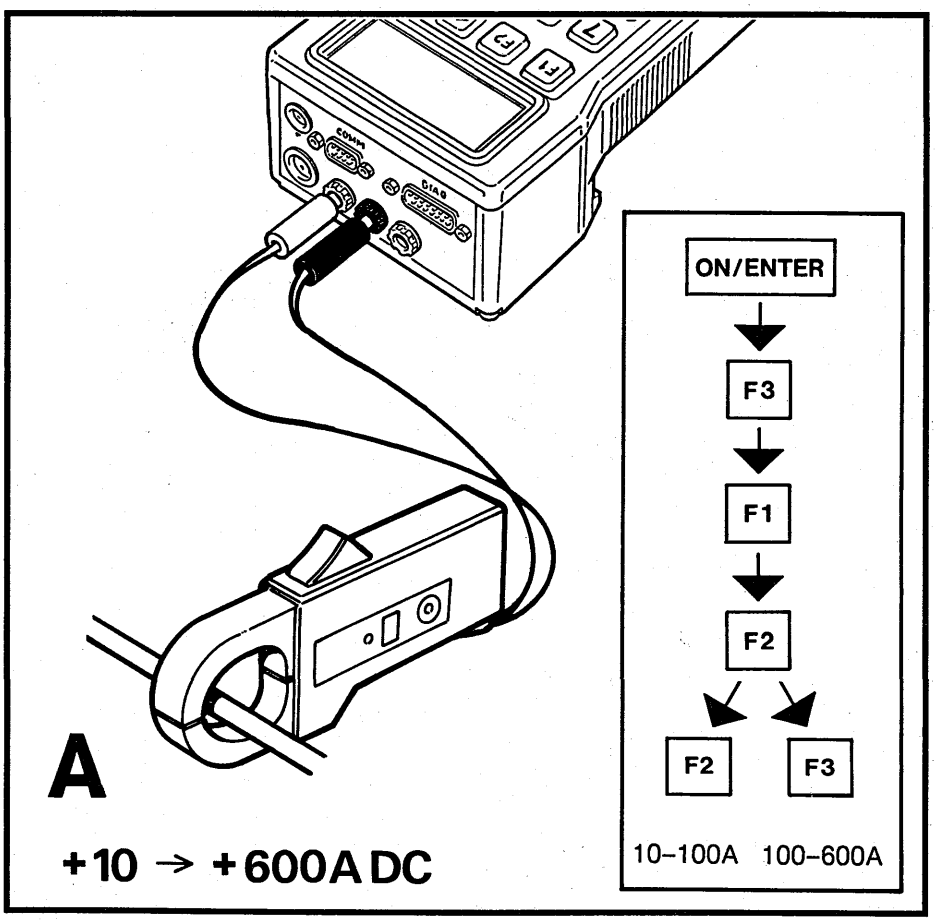
As an ammeter, the ISAT tester has a range from -10 to +10 Amps D.C. with an accuracy better than 1%. The meter has an autoranging function which automatically selects the correct measuring range.

Current values in excess of 8 Amps must not be measured for more than 30 seconds.

There is a 10 amp in-line fuse in the tester plug end of the red multimeter lead.

Introduction to ISAT

Ammeter (10–600) Amps) Function

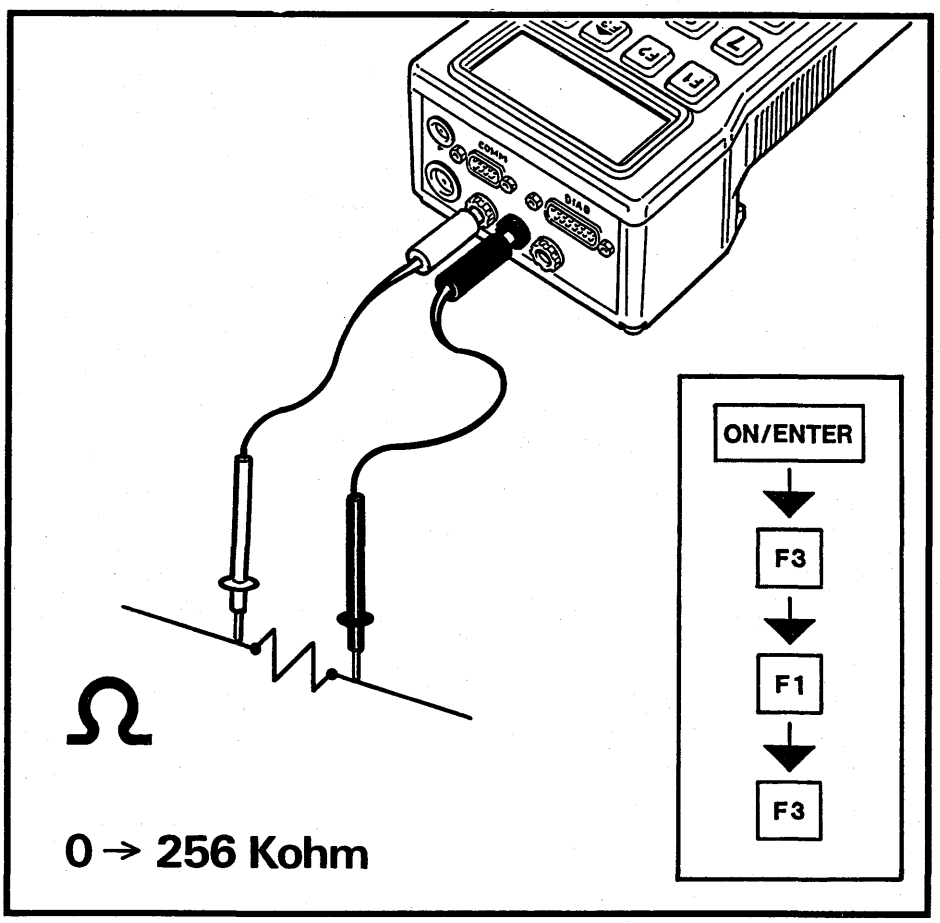


To use the ISAT as an ammeter to read current between 10 and 600 amps, connect the accessory inductive proximity detector to the red and black ports.

Select the Ammeter function by using one of the two following key sequences:

ON/ENTER, F3, F1, F2, F2 for 10–100 amps.

ON/ENTER, F3, F1, F2, F2 for 100–600 amps.



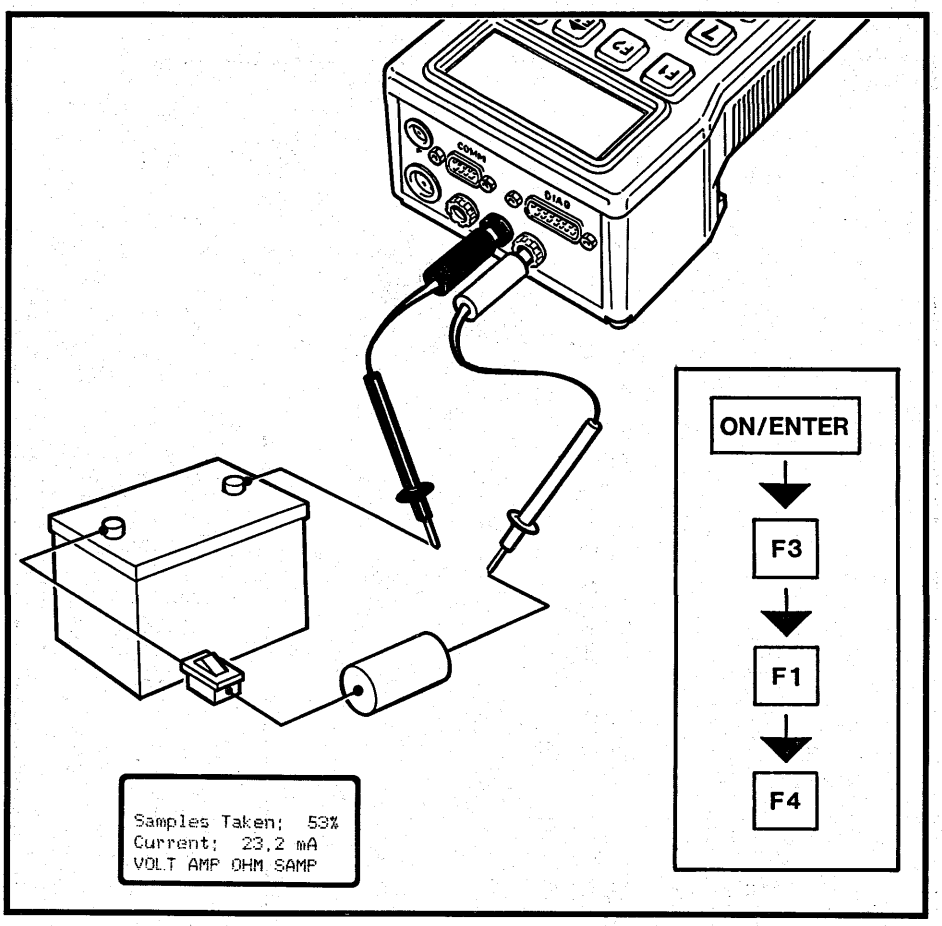
To use the ISAT as an ohmmeter, connect the DMM test leads into the red and black ports.

Select the Ohmmeter function by the following key sequence:
ON/ENTER, F3, F1, F3.

As an ohmmeter, the ISAT tester has a range from 0 to +256 Kohm, with an accuracy better than 0.5%. The meter has an autoranging function which automatically selects the correct measuring range.

Introduction to ISAT

Sampling Function



To use the ISAT as a sampling meter, connect the DMM test leads into the white and black ports.

Select the sampling function by the following key sequence:
ON/ENTER, F3, F1, F4.

Select the correct frequency, the duration of the test will vary according to the frequency:

F1 5 Hz. (Duration 3 minutes 20 seconds)

F2 10 Hz. (Duration 1 minute 40 seconds)

F3 20 Hz. (Duration 50 seconds)

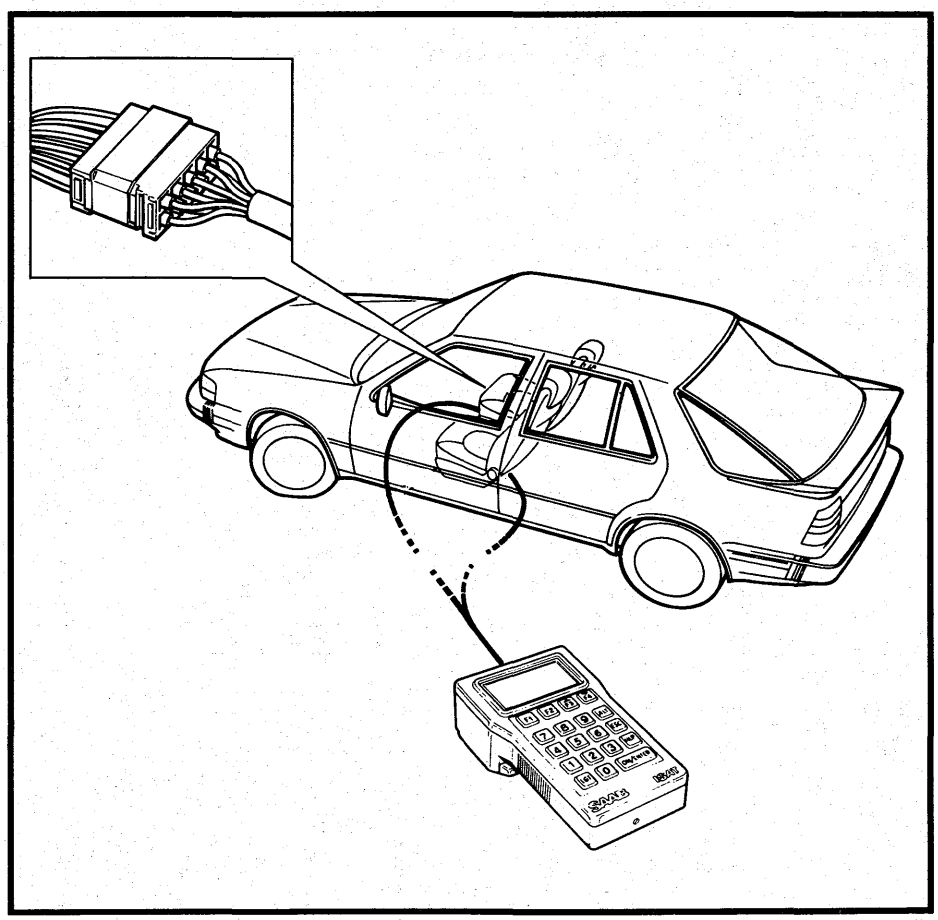
F4 100 Hz. (Duration 10 seconds)

Depending on frequency selected, the ISAT tester will measure at regular intervals the instantaneous value of the selected unit for 1000 times.

During the test, the display will show the number of measurements taken as a percentage of the total, continually updating the display as further measurements are made.

After the test has been completed, the minimum, mean and maximum values can be read by scrolling through the display. Key F3 to move down the display, Key F4 to move up the display.

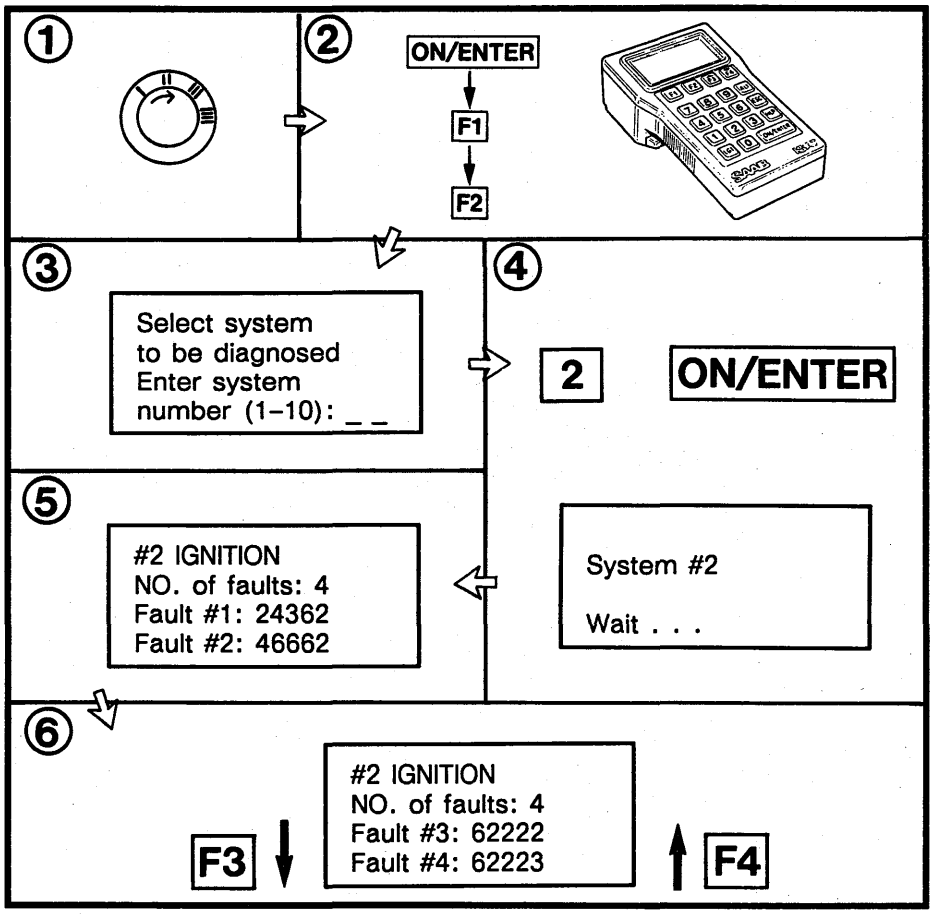
ISAT As A Diagnostic Tester



There are two diagnostic ports under the front of the passenger's seat. The black connector handles engine management functions (DI/APC, LH) and the green connector handles interior systems (ACC and EDU).

Introduction to ISAT

Selection Of Diagnostic Mode



After connecting the tester, the procedure for checking the ECU memory is:

1 SWITCH THE IGNITION TO RUN, NOT START

2 Switch on the tester and select the correct diagnostic mode.

3 Key sequence for Saab Direct Ignition system test:
ON/ENTER, F1, F2

The display asks operator to enter code number of system.

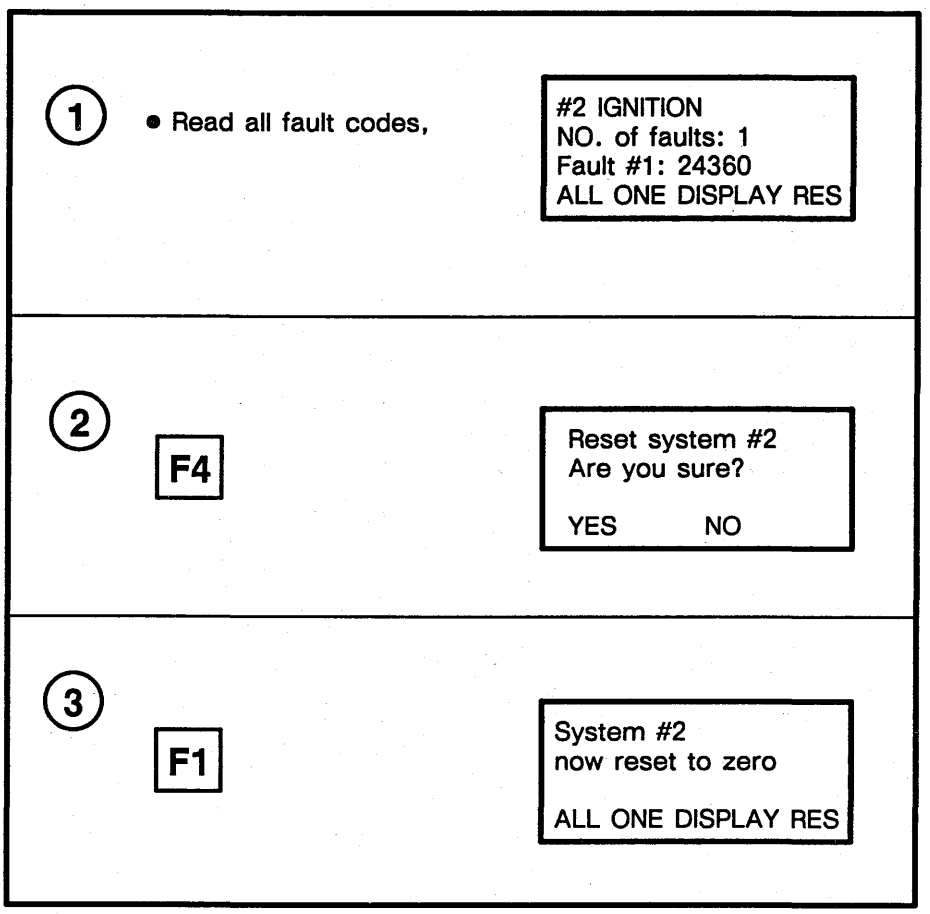
4 Press Key 2 for Saab DI, then press the ON/ENTER key to execute the function.

ISAT will now copy the data about any faults from the memory of the DI electronic control unit to its own memory.

Display explains that copying is in progress. Wait until it is complete

5 When copying is complete, display shows the System tested, the number of faults and the codes of the first two faults.

6 If more than 2 faults are indicated, press key F3 to scroll the display upwards to show the other two faults. To scroll the display down again, press key F4.



To clear fault codes and reset the system being diagnosed:

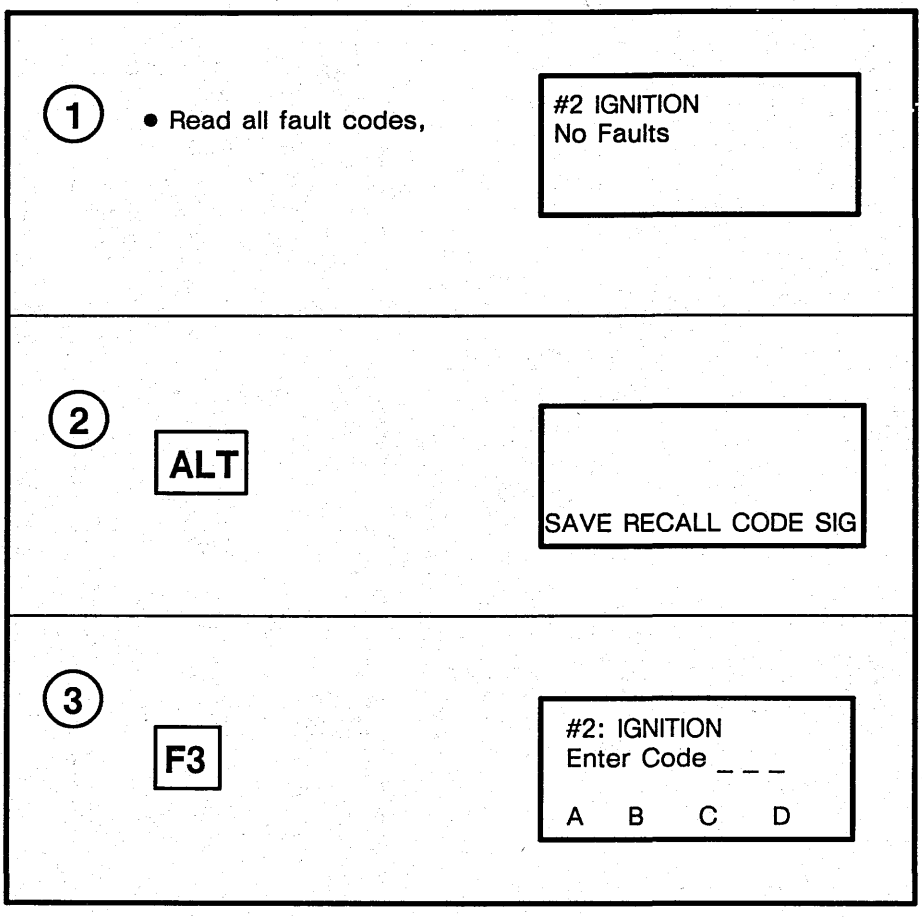
1 Read all fault codes

2 Press key F4 to access the RESet menu. The tester now asks you to confirm that you wish to reset this system.

3 Press key F1 to confirm

Before returning the car to the customer, always read and then erase any stored fault codes using the RESet function as shown above.

An alternate method of erasing fault codes is to enter the command code 900.



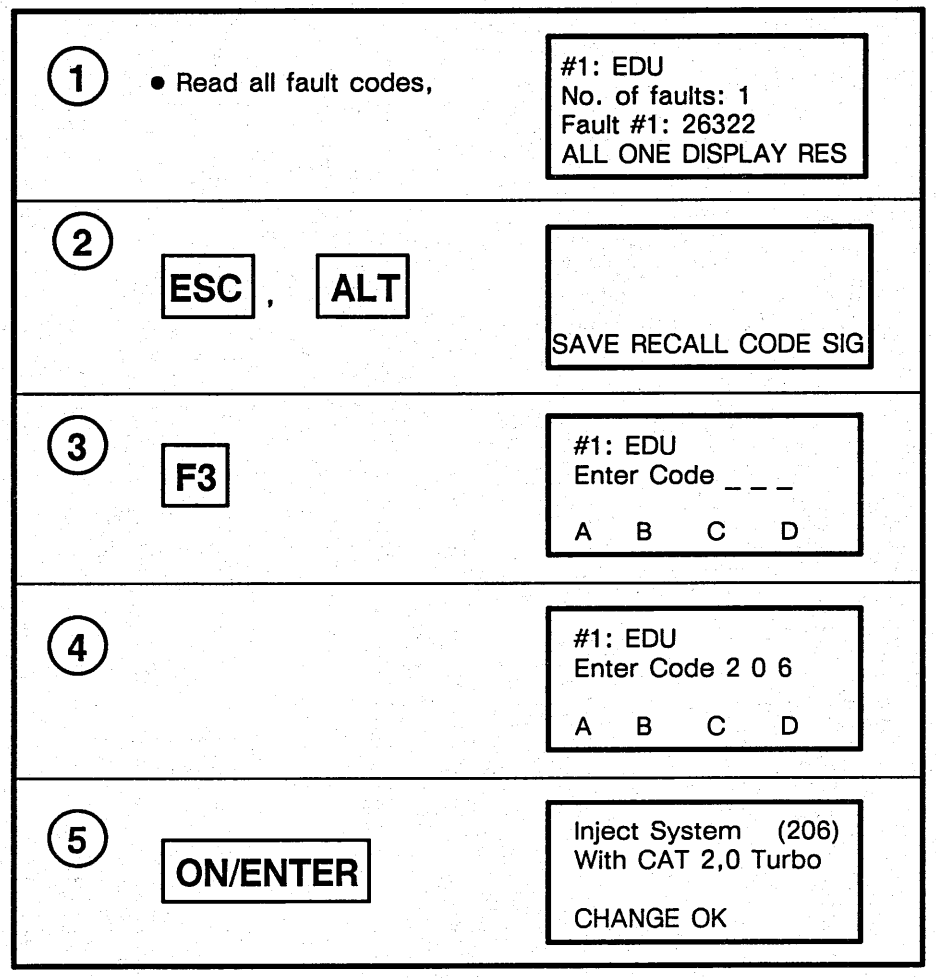
To troubleshoot a system using ISAT-issued command codes:

1 Perform the diagnostic system check and read all fault codes

2 Press the ALT key to access the menu with the command CODE function

3 Press key F3 to access the command CODE menu

4 Enter the appropriate command code using the number keypad and check for the correct function of the system being tested.



Using ISAT it is possible to perform certain programming and calibrating functions on the EDU.

1 Read all fault codes first

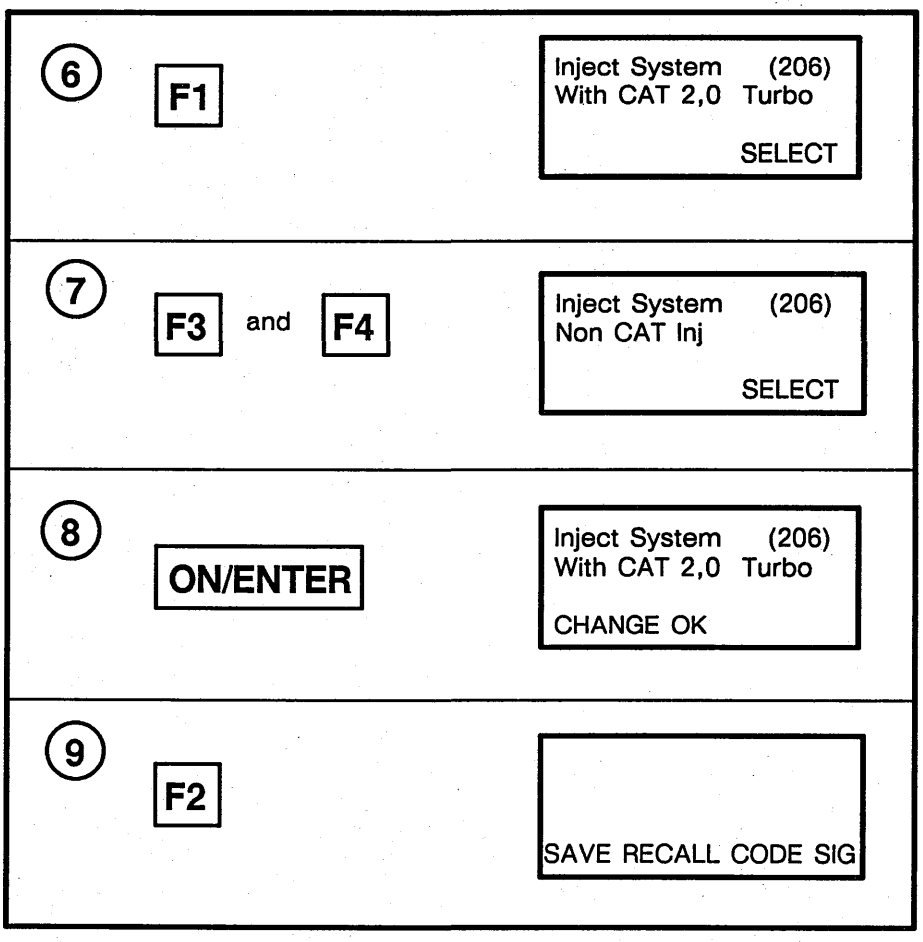
2 Press the ESC key then the ALT key to access the menu with the command CODE function

3 Press the F3 key to bring up the command CODE menu

4 Enter the command code for the function to be programmed. An example is code 206 for programming the engine type for the EDU

5 Press the ON/ENTER key to bring up the engine type currently programmed into the EDU

continued next page



6 Press key F1 (change) if you wish to change the selection

7 Press key F3 or F4 to scroll through the menu

8 Lock in the correct selection by pressing ON/ENTER

9 Press key F2 to confirm the selection and bring up a blank screen

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