AT-2*plus*

6-Channel Electrocardiograph
6-Kanal-Elektrokardiograph
Electrocardiographe à 6 canaux

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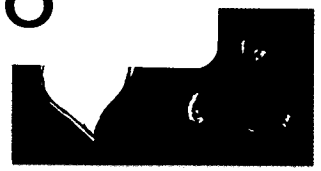

The Art of Diagnostics

SCHILLER

www.schiller.ch

AT-2*plus*

6-Channel Electrocardiograph
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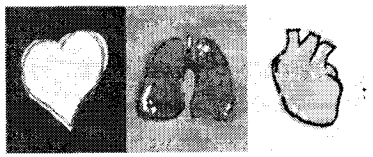
Electrocardiographe à 6 canaux



THE ART OF DIAGNOSTICS

AT-2*plus* User Guide - English
AT-2*plus* Gebrauchsanweisung -Deutsch
Guide de l'Utilisateur pour l'AT-2*plus* - Français

Article Number 2. 510220h
Sept. 1997, Aug. 1998, Jun. 1999, Oct. 99, Nov. 99, Dec. 99,
Feb. 00, May 01, Aug. 01

Associated Documents

Guide to the SCHILLER Interpretation and Measurement Program E/ D/ F Article Number 2.510179

SCHILLER AG
Altgasse 68
CH - 6341 Baar, Switzerland

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CE 0123 93/42/EEC Medical Devices:
0123 `Notified Body` TÜV P. S.

Where to Obtain Service and Sales Advice
Kundendienst und Verkaufs-/Beratungsstellen
Coordonnées de nos services d'assistance technique et commerciale

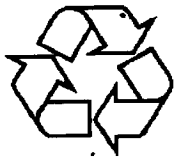
USA / Canada	***WELCH ALLYN SCHILLER Inc.**, 7420 Carroll Road, San Diego, CA , US-92121-2334 USA*	
	Tel.: +1 858 635 6023	*Fax : +1 858 635 6611*
	Home Page : www.welchallyn.com	
Asia Pacific	***SCHILLER Asia Pacific**, 10 Jalan SS 3/33, Taman Universiti, 47300 Petaling Jaya, Selangor, Malaysia*	
	Tel.: + 603 7877 5336	*Fax : + 603 7877 5744*
Austria	***SCHILLER HmbH**, Kampmüllerweg 24, A-4044 Linz, Austria*	
	Tel.: + 43 732 709 90	*Fax : + 43 732 757 000*
France	***SCHILLER Medical S.A**, BP 50, 19, Avenue de la Gare, F-67162 Wissembourg / Cedex, France*	
	Tel.: +33 3 88 63 36 00	*Fax : +33 3 88 94 12 82*
Germany (EU authorized representative)	***SCHILLER Medizintechnik GmbH**, Rudolf-Diesel Strasse 14, D-85521 Ottobrunn, Germany*	
	Tel.: + 4989 620 981 0	*Fax : + 4989 609 509 0*
India	***SCHILLER Healthcare India Pvt. Ltd.**,D.C.Silk Mills Compound, 'A' Wing, 1st floor, 5, Chunawala Estate, Kondivitta Lane, Andheri - Kurla Road, Andheri (E, Mumbai - 400 059, India*	
	Tel.: + 9122 826 3520	*Fax : + 9122 826 3525*
Italy	***ESAOTE Spa (SCHILLER)**, Via di Caciolle 15, I-50127 Firenze, Italy*	
	Tel.: + 39055 4229 201	*Fax : + 39055 4229 208*
Switzerland	***SCHILLER Reomed AG**, Riedstrasse 14, CH-8953 Dietikon, Switzerland*	
	Tel.: +411 744 3000	*Fax : + 411 740 3710*
All other countries	***SCHILLER AG**, Altgasse 68, CH-6341 Baar, Switzerland*	
	Tel.: + 4141 766 4242	*Fax : + 4141 761 0880*
	Home Page : www.schiller.ch	

AT-2plus

English

This equipment has been tested and found to comply with the limits for a class A digital device, pursuant to both Part 15 of the FCC (Federal Communications Commision) Rules and the radio interference regulations of the Canadian Department of Communications. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with this instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Disposal Instructions and Battery Care



Battery Care and Disposal Instructions

- DO NOT DISPOSE OF THE BATTERY BY FIRE OR INCINERATOR - DANGER OF EXPLOSION
- DO NOT ATTEMPT TO RECHARGE THE BATTERY - DANGER OF EXPLOSION
- DO NOT OPEN THE BATTERY CASING - DANGER OF ACID BURN

Only dispose of the battery in official recycling centres or municipally approved areas. Alternatively used batteries can be returned to Schiller AG for disposal.

Unit Disposal Instructions

Units no longer required can be returned to Schiller AG for disposal. Alternatively dispose of the unit in municipally approved recycling centres.

Power Supply

The mains connection is on the rear of the unit.

The power supply voltage is set by the factory for100-115V(nom. 110V) or 220-240V (nom. 230V) working. The setting is indicated by the indented metal strip on the fuse panel. Contact your dealer if the voltage needs to be changed.

The mains indicator lamp on the keyboard is always lit when the unit is connected to the mains supply. The unit can either be operated from the mains supply or from the built-in rechargeable battery.

Changing a Mains Fuse

If it is necessary to change a fuse, always replace with the correct rating i.e 2x200mAT for 230V, or 2x315mAT for 110V.

To change a fuse press the two retaining lugs on side of the fuse panel (situated below the mains connector on the back panel. Remove the fuse panel and replace the fuse(s). Click back the fuse panel.

Terms of Warranty

The SCHILLER AT-2*plus* is warranted against defects in material and manufacture for the duration of one year (as from date of purchase). Excluded from this guarantee is damage caused by an accident or as a result of improper handling. The warranty entitles free replacement of the defective part. Any liability for subsequent damage is excluded. The warranty is void if unauthorized or unqualified persons attempt to make repairs.

In case of a defect, contact your dealer or the manufacturer.

The manufacturer can only be held responsible for the safety, reliability, and performance of the apparatus if:

- assembly operations, extensions, readjustments, modifications, or repairs are carried out by persons authorized by him, and
- the AT-2*plus* and approved attached equipment are used in accordance with the manufacturers instructions.

THERE ARE NO EXPRESS OR IMPLIED WARRANTIES WHICH EXTEND BEYOND THE WARRANTIES HEREINABOVE SET FORTH. SCHILLER MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE PRODUCT OR PARTS THEREOF.

About this Handbook

The philosophy of SCHILLER is one of continuous improvement. Our aim is to provide the user with the most up-to-date information and the latest technological developments.

Your suggestions and comments are welcome on all SCHILLER documentation. Please contact the SCHILLER Technical Documentation Department.

PHYSICIAN'S RESPONSIBILITY

THE AT-2 PLUS ELECTROCARDIOGRAPH IS PROVIDED FOR THE EXCLUSIVE USE OF QUALIFIED PHYSICIANS OR PERSONNEL UNDER THEIR DIRECT SUPERVISION. THE NUMERICAL AND GRAPHICAL RESULTS FROM A RECORDING MUST BE EXAMINED WITH RESPECT TO THE PATIENTS OVERALL CLINICAL CONDITION. THE RECORDING PREPARATION QUALITY AND THE GENERAL RECORDED DATA QUALITY, WHICH COULD EFFECT THE REPORT DATA ACCURACY, MUST ALSO BE TAKEN INTO ACCOUNT.

IT IS THE PHYSICIANS RESPONSIBILITY TO MAKE THE DIAGNOSIS OR TO OBTAIN EXPERT OPINION ON THE RESULTS, AND TO INSTITUTE CORRECT TREATMENT IF INDICATED.

FEDERAL LAW IN THE USA RESTRICTS THIS DEVICE TO SALE BY OR ON THE ORDER OF A PHYSICIAN

Safety Notices

TO PREVENT ELECTRIC SHOCK DO NOT DISASSEMBLE THE UNIT. NO SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED PERSONNEL ONLY.

DO NOT USE THIS UNIT IN AREAS WHERE THERE IS ANY DANGER OF EXPLOSION OR THE PRESENCE OF FLAMMABLE GASES SUCH AS ANAESTHETIC AGENTS.

IN THE EVENT OF ACCIDENTAL LCD BREAKAGE AND RESULTANT LEAKAGE OF FLUID, DO NOT INHALE, INGEST OR MAKE CONTACT WITH THE SKIN. IF CONTACT IS MADE RINSE IMMEDIATELY.

THIS PRODUCT IS NOT DESIGNED FOR STERILE USE.

THIS PRODUCT IS NOT DESIGNED FOR OUTDOOR USE.

SWITCH THE UNIT OFF BEFORE CLEANING AND DISCONNECT FROM THE MAINS.

DO NOT, UNDER ANY CIRCUMSTANCES, IMMERSE THE UNIT OR CABLE ASSEMBLIES IN LIQUID.

THE DEVICE MUST ONLY BE OPERATED USING BATTERY POWER IF THE EARTH CONNECTION IS SUSPECT OR IF THE MAINS LEAD IS DAMAGED OR SUSPECTED OF BEING DAMAGED.

DO NOT USE HIGH TEMPERATURE STERILISATION PROCESSES (SUCH AS AUTOCLAVING). DO NOT USE E-BEAM OR GAMMA RADIATION STERILISATION.

DO NOT USE SOLVENT CLEANERS

USE ONLY ACCESSORIES AND OTHER PARTS RECOMMENDED OR SUPPLIED BY SCHILLER AG. USE OF OTHER THAN RECOMMENDED OR SUPPLIED PARTS MAY RESULT IN INJURY INACCURATE INFORMATION AND/ OR DAMAGE TO THE UNIT.

THE AT-2PLUS COMPLIES WITH EMC REGULATIONS FOR MEDICAL PRODUCTS WHICH AFFORDS PROTECTION AGAINST EMISSIONS AND ELECTRICAL INTERFERENCE. HOWEVER SPECIAL CARE MUST BE EXERCISED WHEN THE UNIT IS USED WITH HIGH FREQUENCY EQUIPMENT.

IT MUST BE ENSURED THAT NEITHER THE PATIENT NOR THE ELECTRODES (INCLUDING THE NEUTRAL ELECTRODE) COME INTO CONTACT WITH OTHER PERSONS OR CONDUCTING OBJECTS (EVEN IF THESE ARE EARTHED).

*THERE IS NO DANGER WHEN USING THE ECG UNIT FOR A **PACEMAKER PATIENT** OR WITH SIMULTANEOUS USE OF OTHER ELECTRICAL STIMULATION EQUIPMENT. HOWEVER, THE STIMULATION UNITS SHOULD ONLY BE USED AT A SUFFICIENT DISTANCE FROM THE ELECTRODES. IN CASE OF DOUBT, THE PATIENT SHOULD BE DISCONNECTED FROM THE RECORDER.*

THIS UNIT IS CF CLASSIFIED ACCORDING TO IEC 601-1. THIS MEANS THAT THE PATIENT CONNECTION IS FULLY ISOLATED AND DEFIBRILLATION PROTECTED. SCHILLER CAN ONLY GUARANTEE PROTECTION AGAINST DEFIBRILLATION VOLTAGE HOWEVER, WHEN THE ORIGINAL SCHILLER PATIENT CABLE IS USED.

IF SEVERAL UNITS ARE COUPLED THERE IS A DANGER OF SUMMATION OF LEAKAGE CURRENT

DO NOT TOUCH THE CASING DURING DEFIBRILLATION

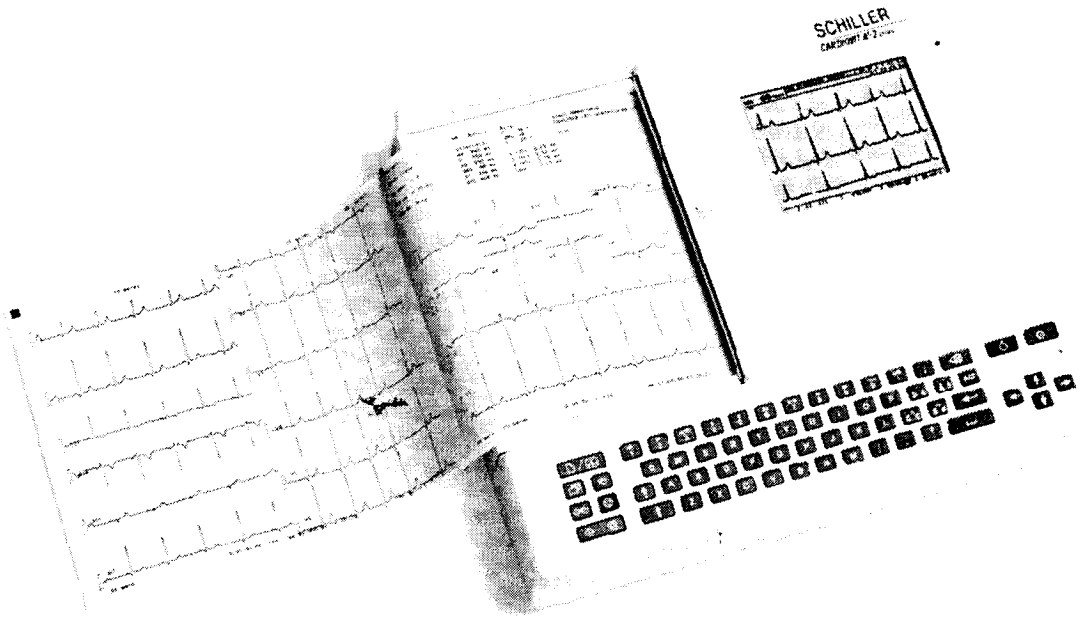
IF THE PATIENT CABLE SHOULD BECOME DEFECTIVE AFTER DEFIBRILLATION, LEAD OFF WILL BE DISPLAYED AND AN ACOUSTIC ALARM GIVEN

Introduction

The CARDIOVIT AT-2*plus* is a 6-channel ECG recorder with all (12) ECG signals simultaneously processed to provide instant ECG recordings. Two automatic recording modes can be individually preset to enable one button ECG recording of preferred print formats.

The AT-2*plus* includes the following features:

- Low weight and compact dimensions
- Large A4 size printout from integrated quality thermal printer
- Built-in rechargeable battery for mains-independent use - 4hrs normal use or 300 printouts on one battery charge
- Large, clear LCD for ECG preview prior to printing
- Simple one key operation for main functions
- Automatic or manual recording modes
- Selectable printing formats
- ECG memory for easy copying
- Interpretation program option (including measurements) for children and adults
- Alphanumeric keyboard for patient data entry and clinical comments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List of Symbols

On

Off

Start manual printout

Stop

Auto Mode ECG Recording
(and printout)

Battery operation
(Flashes when battery
capacity limited.

Mains connected

Potential Equalisation
(common ground)

Attention - General warning sign -
see accompanying documentation

Type CF equipment - safe for internal
applications. Note: The paddles indicate
that the equipment is defibrillator proof

Copy function

Myogram Filter Off/On

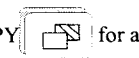
CE 0123

93/42/EEC Medical Devices:
0123 'Notified Body' TÜV P.S.

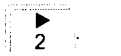
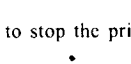
AT-2*plus* - User Guide

Short Form Instructions

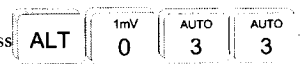
Automatic ECG Recording

- Prepare skin, hook up patient.
- Switch unit on, press ON  .
- Press  and enter patient data.
- Press  again and wait for at least 10 seconds until a clear and stable trace is displayed.
- Press AUTO  to record and print.
- Press COPY  for additional copies.

Manual ECG Recording (Rhythm Strip)

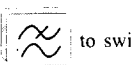
- Prepare skin, hook up patient.
- Switch unit on, press ON  .
- Press MAN START  .
- Change lead group with  and  .
- Press STOP  to stop the printout.

Electrode hook-up check

- Press  for electrode check.

Best results are obtained when the electrode voltage readings (right column) are between ±50mV.

Filter On/Off

- Press  to switch the (Myogram) filter On / Off.

System Configuration

- Press  to print system settings.

SCHILLER

connected

l Equalisation
n ground)

n - General warning sign -
mpanying documentation

equipment - safe for internal
ons. Note: The paddles indicate
quipment is defibrillator proof

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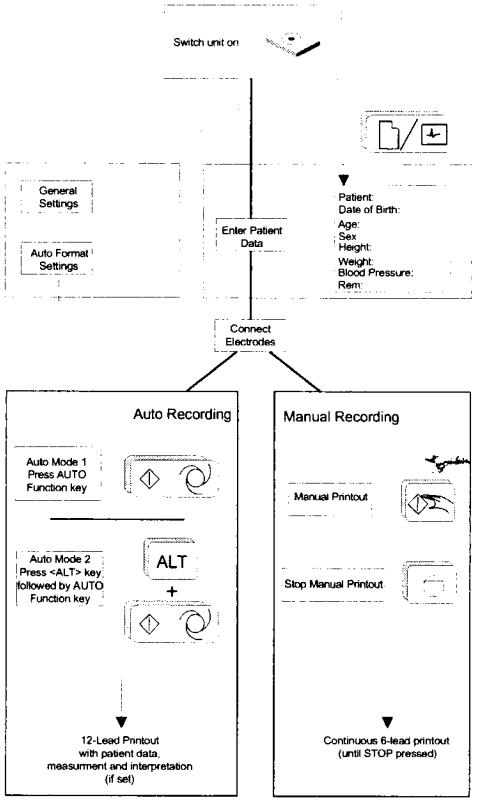
Filter Off/On

EC Medical Devices:
lotified Body' TÜV P.S.

Modes of Operation



Automatic Mode

Automatic Mode provides a printout giving 10 seconds of ECG recording of all 12 leads with a choice of 2 different formats.

The following can be programmed freely for each of the 2 formats before recording:

- Lead Format
- Chart Speed
- With the optional interpretation program installed it is also possible to select the measurement table, average cycles with optional markings and interpretation statements for the printout.

For further information see paragraph `Settings for Automatic Mode`.

Manual Mode

Manual Mode provides a real time printout of 6 leads that are selected and indicated on the screen.

The following can be freely selected before or during recording:

- Lead Group
- Chart Speed
- Sensitivity
- Myogram Filter

For further information see paragraph `ECG Recording in Manual Mode` following.

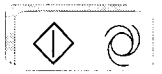
Automatic Mode

In **automatic mode**, a full 12-lead ECG is printed in one of two predefined formats with a sensitivity of 10 mm/mV. These two formats are selected by the user to suit his specific needs and requirements.

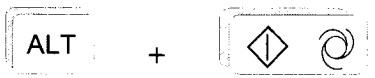
Auto Sensitivity

To reduce the possibility of overlapping traces, an auto sensitivity reduction is applied in Auto Mode (default). This means that the unit detects very large waveform amplitudes and sets the sensitivity for the extremity and/or precordial leads to 5 mm/mV. An `A` on the bottom line of the LCD indicates that Auto sensitivity is set.
To disable this function, the AUTO SENSITIVITY key (key 3) must be pressed.

To start the automatic ECG recording in Format 1, press the AUTO key:



To start the automatic recording in the second format, press the ALT key followed by the AUTO key:



The printout gives the following:

- ECG recording of all leads in either Standard or Cabrera format according to selection
- Sensitivity
- Heart Rate
- Speed
- Filter Settings
- Time and Date
- Interpretation statements
- Average Cycles
- Intervals
- Axis
- Sokolow Index (ECG index for hypertrophy)
- Detailed Measurement Table

To obtain an extra printout of the ECG recording in Format 1, simply press the COPY key 

To obtain an extra printout of the second format, press the ALT key followed by the COPY key 

The Auto mode settings for the two formats are detailed in the paragraph entitled `Settings for Automatic Mode` later in this book

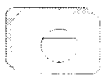
English

Manual Mode

Manual mode provides a direct printout of the real-time ECG with full control of parameter selection.

To start the manual recording of a real-time ECG, press the MANUAL Printout key

To stop the manual recording (printout) press the STOP key



The printout provides you with the following:

- Six (selected) leads with lead identification.
- On the lower edge, the chart speed, user identification and filter settings (if on).
- At the top, the heart rate as current average of 4 beats, trace sensitivity, and the time and date

The following can be freely chosen during or before the recording:

Lead Group by means of the LEAD FORWARD and LEAD BACKWARD key

The following lead groups are selectable:

- I, II, III / aVR, aVL, aVF
  (Cabrera: aVL, I, -aVR / II, aVF, III)
- V1, V2, V3 / V4, V5, V6
- II, aVF, III / V2, V4, V5
- V4, V5, V6 / V7, V8, V9

Note: The LCD only displays three leads at one time. When the lead forward or lead backward key is pressed, the following /preceding three lead group is displayed

Manual Mode

Chart Speed Select speed 5, 10, 25 or 50mm/s by means of the SPEED keys:

5/10	25	50
7	8	9

Notes: Key 7 is a toggle key -press once and 5 is selected, press a second time and 10mm/s is selected.

When the 25 or 50mm/s key is pressed, the same speed is set on both the screen and the (manual) printout. When 5 or 10 mm/s is selected, this affects the manual printout speed only.

Sensitivity Select 5, 10 or 20 mm/mV by means of the SENSITIVITY keys:

5	10	20
4	5	6

Myogram Filter Switch the filter ON or OFF with the FILTER key:

`FILTER` is displayed on the bottom line of the LCD when the filter is switched on.

Recentering To re-centre the ECG traces, press the 1mV key

1mV
0

WARNING: *AFTER HEAVY ARTEFACTS OR LEAD OFF, THE INDICATION OF THE HEART RATE MAY NOT BE RELIABLE.*

Patient Cable Connections

WARNING

In the case of a lead-off during ECG acquisition, (indicated acoustically, on the LCD and/or on the printout), the resultant printout, screen display, and interpretation if given, cannot be used for diagnosis. The electrodes must be reapplied and a new ECG must be carried out. If the recording had been stored, the recording must be deleted from memory.

The accessory kit of the electrocardiograph includes a 10-lead patient cable. This cable is plugged into the patient cable socket on the right-hand side of the unit and secured with the two screws.

The CARDIOVIT AT-2*plus* is CF rated. The patient connection is fully isolated and defibrillation protected. Protection against defibrillation voltage is however only ensured, if the original SCHILLER patient cable (Part-no. 2.400070 / USA: 2.400071) is used. Make sure that during ECG recording neither the patient nor the conducting parts of the patient connection or the electrodes (including the neutral electrode) come into contact with other persons or conducting objects (even if these are earthed).

The quality of the ECG is dependent on the preparation and the resistance between the skin and the electrode. To ensure a good quality ECG and minimise the skin/electrode resistance, remember the following points:

1. **Ensure that the patient is warm and relaxed.**
2. **Shave electrode area before cleaning.**
3. **Thoroughly clean the area with alcohol.**
4. **Place the** C4 **electrode first - in the fifth intercostal space on midclavicular line. Then place:**

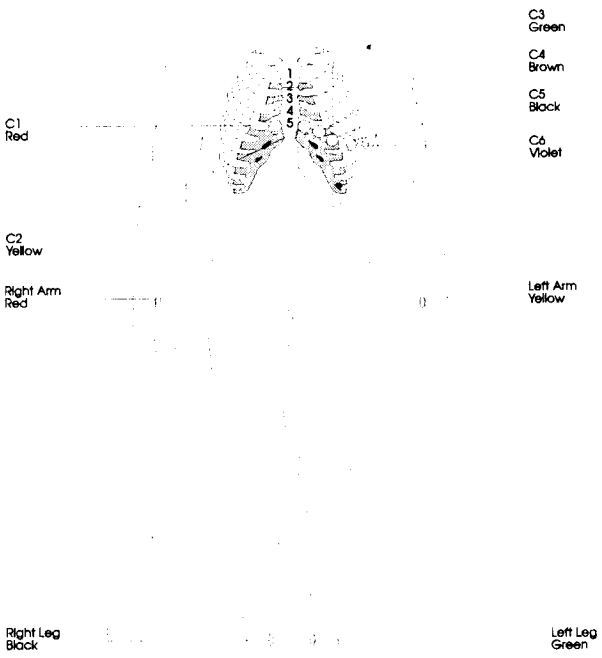
- C1 **in fourth intercostal space at the right sternal border**
- C2 **in fourth intercostal space at the left sternal border**
- C3 **between, and equidistant to, C4 and C2**
- C6 **on left midaxillary line on the same level as C4**
- C5 **between, and equidistant to, C4 and C6**

The electrode placements shown on the following page are labelled with the colors according to IEC requirements. The equivalent AHA colors are given on the table opposite.

Patient Cable Connections

IEC		AHA	
N	Black	RL	Green
R	Red	RA	White
C1	White/Red	V1	Brown/Red
C2	White/Yellow	V2	Brown/Yellow
C3	White/Green	V3	Brown/Green
C4	White/Brown	V4	Brown/Blue
C5	White/Black	V5	Brown/Orange
C6	White/Violet	V6	Brown/Violet
L	Yellow	LA	Black
F	Green	LL	Red

Standard Leads



Location & Power

Location

Do not keep or operate the apparatus in a wet, moist, or dusty environment. Also, avoid exposure to direct sunlight or heat from other sources. Do not allow the unit to come into contact with acidic vapours or liquids, as such contact may cause irreparable damage. The unit should not be placed near X-ray or diathermy units, large transformers or motors. The unit must be placed on a flat surface and must not be operated in areas where there is any danger of explosion.

Power Supply

The mains connection is on the rear of the unit.

The power supply voltage is set by the factory for100-115V(nom. 110V) or 220-240V (nom. 230V) working. The setting is indicated by the indented metal strip on the fuse panel. Contact your dealer if the voltage needs to be changed.

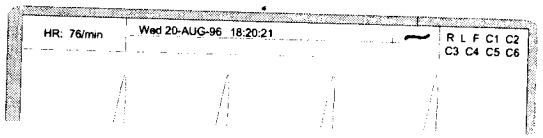
The mains indicator lamp on the keyboard is always lit when the unit is connected to the mains supply. The unit can either be operated from the mains supply or from the built-in rechargeable battery. The power source is indicted on the top line of the LCD.

Changing a Mains Fuse

If it is necessary to change a fuse, always replace with the correct rating i.e 2x200mAT for 230V, or 2x315mAT for 110V.

To change a fuse press the two retaining lugs on side of the fuse panel (situated below the mains connector on the back panel. Remove the fuse panel and replace the fuse(s). Click back the fuse panel.

Power Indication



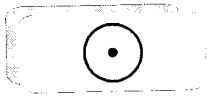
When mains is connected a mains symbol is displayed (as shown above). When the unit is running on battery power a battery symbol is displayed.

When battery capacity is limited, the battery symbol flashes on and off.

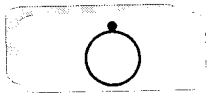
To recharge the battery, connect the apparatus to the mains supply by means of the supplied power cable. A totally discharged battery needs less than 15 hours to be fully recharged (60% in less than 3 hours, 90% in less than 7 hours). A fully charged battery gives approximately 4 hours of normal use. The unit can remain connected to the mains supply without any danger of damage to either the battery or the unit.

Switching On and Off

The CARDIOVIT AT-2*plus* is switched on with the green ON key



and off by means of the red OFF key

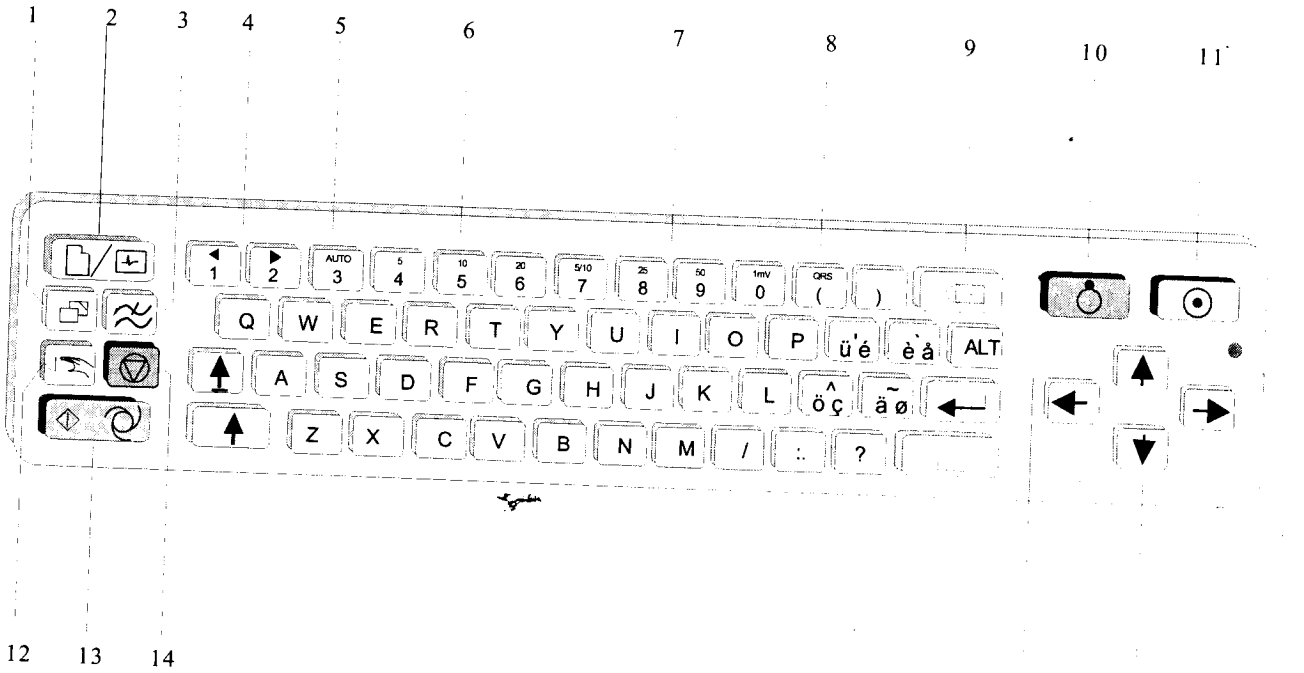


The unit is automatically switched off after 5 minutes (30 seconds if battery capacity is limited) if no key is pressed and the patient cable is not connected.

Potential Equalisation

If the AT-2*plus* is used in conjunction with other patient connected equipment, we recommend that the potential equalisation stud on the rear of the unit is connected to the hospital/ building common ground with the yellow/green ground cable (Part-no. 2.310005). When working from an emergency vehicle, the vehicle common ground can be used.

Keyboard


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
1 2 AUTO 3 4 5 6 7 8 9 0 ( )
Q W E R T Y U I O P ü é è à ALT
A S D F G H J K L ö ç ä ø
Z X C V B N M / : ?

Keyboard

1 Print extra copy - *of Auto mode recording currently in memory*. Press the ALT key first followed by this key to obtain a copy in Auto format 2.

2 Display/enter patient data. When the patient data is displayed, pressing this key again returns to the ECG. Use the up/down arrows to go to the next data entry field.

In the `Born` (date of birth field), only the patients year of birth need be entered (2 or 4 digits), - patient age is calculated to the nearest year. To calculate the age precisely, the day, month and year (2 or 4 digits) must be entered.

3 Myogram filter ON / OFF. The cutoff frequency can be defined and is detailed in `Settings`.

4. The top figures on the number keys designated > and < changes the lead group displayed on the screen.

5. Auto sensitivity key - automatically sets the ECG printout sensitivity (in AUTO mode only) to the best setting for the signal strength (5mm/mV or 10mm/mV)

6. The top figures on the number keys designated 5, 10, and 20 set the sensitivity of the ECG both on the screen and on the (manual) printout. The sensitivity is 5, 10 or 20 mm / mV.

7. The top figures on the number keys designated 5/10, 25, and 50 set the speed of the ECG both on the screen and on the (manual) printout. The speed on the screen can only be set to 25 or 50 mm / s. The speed of the manual printout can be 5, 10, 25 or 50 mm/s. The 5 and 10 mm/s settings are both on the same key which toggles the two speeds.

8. The top character `QRS` toggles the QRS beeper ON/ OFF

9. Delete last typed character.

10. Switch the unit OFF.

11. Switch the unit ON.

12. Manual mode recording - start continuous printout of ECG - until STOP key pressed

13. Auto Mode recording (in Auto mode 1). Press ALT followed by the AUTO key for auto mode 2.

14. STOP printout / confirm (new) setting

15. ALT key - key for initiation of setups and selection of second format for printout and auto mode recording

16. In ECG mode use the UP/DOWN arrows to adjust screen contrast.

    When entering patient data use the LEFT/RIGHT arrow keys to move cursor in data field. Use the UP/DOWN arrow keys to go up/down to the next data entry

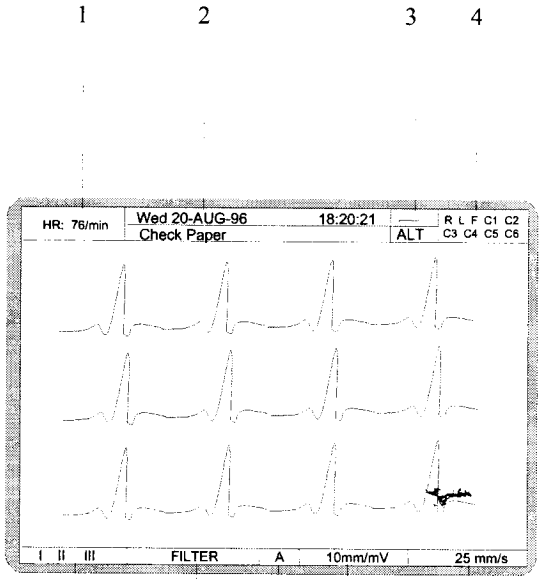
17. Mains Indicator - lit when mains connected.

Second letters on the keyboard - è, é, ç, ø are reached by holding the ALT key pressed before the letter key. Accents on a letter e.g. ô, ñ etc. are reached by pressing <SHIFT> and the accent required (one of the group of four keys situated to the left of the ALT key), and then the letter. In addition the following special characters are available:

Key combination: SHIFT +	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*0*
Character	!	@	#	$	%	&	/	*	"	=

English

LCD Screen



1. Current Heart Rate (averaged over 4 beats and refreshed every 2 seconds). The HR is also given on a manual printout. *Note that with an auto mode printout the HR is averaged over the full 10 seconds of the recording.*
2. Top line - Current Day, Date and Time

   Bottom Line - System messages
3. Top Line - Current power source - mains or battery. When battery capacity is limited the battery symbol flashes.

   Bottom line - `ALT` in this box indicates that the ALT key has been pressed.
4. Electrode connections - when a lead flashes it indicates that the electrode resistance is too high. The electrode must be reapplied
5. Lead indication (leads currently displayed on the screen). Change the lead group with the keys `1` and `2`.
6. Myogram Filter indication - `Filter` = filter ON; no indication = filter OFF. Switch the filter on or off with the Filter key.
7. An `A` in this box indicates that automatic sensitivity is selected (auto mode printout only). Switch automatic sensitivity on or off with key `3`.
8. Sensitivity - 5, 10 or 20 mm/mV. Change the sensitivity with the keys `4`, `5`, and `6`.
9. Speed - 25 or 50 mm/s. Change the speed with the keys `8`, and `9`.

Settings

Each parameter is set by means of a code. This code comprises a combination of keys starting with the **ALT** key followed by two or three numbers. The setting is confirmed with the **STOP** key. As soon as the **ALT** key is pressed, the keyboard is dedicated to the programming function.

When the ALT key is pressed `ALT` appears on the LCD (see previous page)

The Alternative (ALT) function is only active for 4 seconds. If a programming key is not pressed within 4 seconds, the unit reverts to standard mode. The ALT key must again be pressed to activate the programming mode

The setting is remembered and the keyboard released for other functions when the **STOP** key is pressed. Once a setting has been confirmed, it is stored in the memory even when the unit is switched off.

On the following pages the programmable parameters and the programming sequences are described in detail.

Settings

The defined formats and settings that are set for your unit can be checked as follows:

Setup Printout				
Entry Key Sequence				*Result*
ALT	0	1	1	Printout of programmed Settings

A printout of the defined settings will be produced and gives the following information, depending on the installed software:

Unit designation Software option installed (C = Interpretation) and Software version

Serial number Serial number of the unit

Leads Standard (S) or Cabrera (C)

ECG Format Long (ooo), Short (o) or Suppressed (-)

MECG Average cycles as defined in auto ECG recording setup (e.g. 4 * 3 (25 mm/s) + 2)

Measurements Enabled (+) or Suppressed (-)

Marks Enabled (+) or Suppressed (-)

Interpretation Enabled (+) or Suppressed (-)

Selected Rhythm leads Leads selected for R1, R2 resp.

Automatic Centering Enabled (+) or Suppressed (-)

Printout of signals Sequential or Simultaneous

Baseline Filter 0.05, 0.15 or 0.30 Hz

Mains Filter 50, 60 Hz or OFF (-)

Myogram Filter 25 or 35 Hz, ON (+) or OFF (-)

Memory & Transmission

Auto. Storage: ON(+) or OFF(-)

Auto. delete: delete all recordings after transmission ON(+) or OFF(-)

Baud rate: 115200, 57600, 38400, 28800, 14400 or 9600

Transmission: Line or Modem

Settings

Interpretation settings:

N/A:+/- 'normal/abnormal' is written (+) or suppressed (-)

U:+/- 'unconfirmed report' is written (+) or suppressed (-)

A30:+/- patient age is assumed to be < 30 (-) or >30 (+)

S: +/- low (-) or high (+) sensitivity

Default Settings

To reset the unit to the basic default settings, proceed as follows:

Reset to Default Settings				
Entry Key Sequence				*Result*
ALT	0	6	6	Reset to default settings

SETTINGS	*STANDARD*	*WITH INTERPRETATION*
LANGUAGE	AS SET	AS SET
LEADS	STANDARD (S)	STANDARD (S)
AUTO FORMAT 1	ECG: 25MM/S, SHORT (O)	ECG : 25MM/S, SHORT (O)
		MECG: 2*6 (50MM/S + 1)
		MEASUREMENTS: SUPRESSED (-)
		INTERPRETATION: ENABLED (+)
		MARKS: ENABLED (+)
AUTO FORMAT 2	ECG: 25MM/S, LONG (OOO)	ECG : 25MM/S, LONG (OOO)
		MECG: NONE
		MEASUREMENTS: SUPRESSED (-)
		INTERPRETATION: DISABLED (-)
		MARKS: ENABLED (+)
RHYTHM LEADS	V1	V1, II
AUTOM. CENTERING	ENABLED (+)	ENABLED (+)
PRINTOUT OF SIGNALS	SEQUENTIAL	SEQUENTIAL
BASELINE FILTER SETTING	0.05HZ	0.05HZ
MAINS FILTER SETTINGS	50HZ (60HZ)	50HZ (60HZ)
MYOGRAM FILTER SETTING	35HZ, OFF	35HZ, OFF
MEMORY AND SERIAL COMMUNICATIO-N INTERFACE OPTION	BAUD RATE 115200 BPS	BAUD RATE 115200 BPS
	AUTO STORAGE ON (+) AUTO DELETETION OFF (-)	AUTO STORAGE ON (+) AUTO DELETETION OFF (-)
	TRANS. MODE: LINE	TRANS. MODE: LINE
MEMORY	AUTO SAVE ENABLED (+) AUTO ERASE DISABLED (-)	AUTO SAVE ENABLED (+) AUTO ERASE DISABLED (-)
INTERPRETATION SETTINGS		N/A: SUPRESSED (-)
		U: ENABLED (+)
		A30: UNDER THIRTY (-)
		S: LOW (-)

Language - American and Standard English

The unit language is set by the software and cannot be changed. However, when English is installed it is possible to select American English or Standard English. The difference is as follows:

American	**Standard English**
measurements in inches	measurements in centimetres
temperature in Fahrenheit	temperature in degrees centigrade.
mains filter setting - 60Hz	mains filter setting - 50Hz
date order mm-dd-yy	date order dd-mm-yy

Additionally, when American is set, further race settings are given and Spiro diagnosis is based on ITS recommendations - see handbook.

The default language is Standard English.

Define American or Standard English as follows:

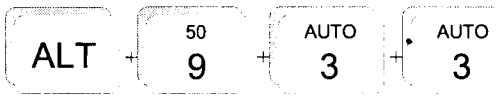
For American English

For Standard English

User Identification

The user identification is printed on all recordings. The user ID can be the department, doctor or hospital etc. Enter the user ID as follows:

Press the ALT key followed by key 9, 3, 3



The user entry field is displayed on the LCD. Enter up to 30 characters via the keyboard.

Confirm the new user ID by pressing the ENTER key.

Note: If the unit is reset to the default settings (see previous page), the user identification must be re-entered

Settings

Filters

There are four different filters which can be set individually as follows:

- Baseline filter
- Smoothing Filter
- Mains filter
- Myogram filter

Baseline and Smoothing Filters (SBS & SSF)

Smoothing Filter The smoothing filter (SSF - SCHILLER smoothing filter) is a low pass filter to suppress high frequency artefacts between the QRS complexes. When this filter is switched on, `SFF` is shown on the bottom line of the automatic printout.

Baseline Filter The baseline filter (SBS SCHILLER Baseline Stabiliser) greatly reduces the baseline fluctuations without affecting the ECG signal. The purpose of the this filter is to keep the ECG-signals on the baseline of the printout. This filter is only effective in auto mode printout.

Baseline Filter				
Entry Key Sequence			*Filter Setting*	*Confirm*
ALT	5	0	0.05 Hz (default)	Press STOP key
		1	0.15 Hz	
		3	0.30 Hz	

Confirm the selection by pressing **STOP**

Note: The set value is the lower limit of the frequency range and is normally set to 0.05 Hz. The settings 0.15 and 0.30 Hz should only be used when absolutely necessary, as the possibility exists that they could affect the original ECG signal, especially the ST segments.

Activating the SBS Filter and SSF Filter

ALT	**5**	**6**	SBS on
ALT	**5**	**7**	SBS off
ALT	**5**	**8**	SSF on
ALT	**5**	**9**	SSF off

Confirm the selection by pressing **STOP**

English

Settings

Mains Filter

The **Mains filter** is an adaptive digital interference filter designed to suppress AC interference without attenuating or distorting the ECG.

Set the mains filter in accordance with the frequency of your local mains supply as follows:

Mains Filter				
Entry Key Sequence			*Filter Setting*	*Confirm*
ALT	8	5	Mains Filter 50 Hz	Press STOP key
		6	Mains Filter 60 Hz	
		9	Mains Filter Off	

Myogram Filter

The **Myogram filter** suppresses disturbances caused by strong muscle tremor. The set value will be the new upper limit of the frequency range as soon as the **FILTER** key is pressed on or programmed as default when the unit is switched on. When the Myogram filter is on `Filter` is displayed on the bottom line of the LCD.

Myogram Filter				
Entry Key Sequence			*Setting*	*Confirm*
ALT	8	2	Myogram Filter 25 Hz	Press STOP key
		3	Myogram Filter 35 Hz	
		1	Myogram Filter active when the unit is first switched on (marked on printout with +)	
		8	Myogram Filter off when the unit is first switched on (marked on printout with -)	

Confirm the selection by pressing the **STOP** KEY

The myogram filter is switched on and off manually with the **FILTER KEY**

*Note: An ECG recorded in auto mode is stored unfiltered. It is therefore possible to print the stored ECG either with or without passing the myogram filter. Filter ON is indicated in the bottom information line of the LCD. When the **FILTER** key is pressed again, the filter is switched off and the `Filter` indication on the bottom information line of the LCD is removed. The cutoff frequency of the myogram filter is set to either 25 or 35 Hz.*

Settings

Defining Lead Sequence & Printout

The required settings can be selected as follows:

Sequences, Print & Auto-centering				
Entry Key Sequence			*Definition*	*Confirm*
ALT	7	1	Standard Lead Sequence	Press STOP key
		2	Cabrera Lead Sequence	
		3	Simultaneous Print	
		4	Sequential Print	
		5	Auto-centering ON	
		6	Auto-centering OFF	

Confirm the selection by pressing **STOP**

The selectable printout forms are:

Simultaneous All ECG leads are printed in the same time segment (in automatic mode only).

Sequential Each group is a contiguous time segment of approximately 2.5 or 5 seconds (in automatic mode only).

Auto-Centering ON All ECG traces are centred dynamically for optimal use of paper width.

Auto-Centering OFF ECG traces are set to a fixed baseline position and may possibly overlap.

The Standard and Cabrera lead groups available for the AT-2*plus* are:

Lead Groups							
Standard				*Cabrera*			
I	V1	II	V4	aVL	V1	II	V4
II	V2	aVF	V5	I	V2	aVF	V5
III	V3	III	V6	-aVR	V3	III	V6
aVR	V4	V2	V7	II	V4	V2	V7
aVL	V5	V4	V8	aVF	V5	V4	V8
aVF	V6	V5	V9	III	V6	V5	V9

Settings

Acoustic QRS Indication

The acoustic QRS beep can be switched on or off at any time by pressing the QRS key 

Time / Date

The required settings can be selected as follows:

Setting the Time and Date						
	Key Sequence				*Enter Data*	*Confirmation*
Time	ALT	9	1	1	HHMMSS	beep
Date	ALT	9	2	2	DDMMYY	beep

	Seasonal Time Variation			
	Key Sequence			
Wintertime to Summertime (+1Hr)	ALT	9	4	4
Summertime to Wintertime (-1Hr)	ALT	9	5	5

Automatic Mode (ECG) Settings

Two separate Auto formats can be defined for the AT-2*plus*. When defining auto format 1 the key sequence ALT `1` precedes the setting. When defining auto format 2 the key sequence ALT `2` precedes the setting.

Automatic ECG Format		
Entry Key Sequence		*Setup Format*
ALT	1	Commence Setup for Auto format 1
	2	Commence Setup for Auto format 2

The automatic mode formats are detailed on the following pages. The ECG format is set as follows:

ECG Format				
Entry Key Sequence			*Printout*	*Confirm*
ALT	1 or 2	1	1	1page x 12 leads at 25mm/s	Press STOP key
			2	One page with the first 8 leads printed for 5s and the last 4 leads printed for 10s	
			5	No leads printed	
			6	Leads are printed in short form (1 sheet)	
			7	Leads are printed in long form (2 sheets)	
			8	Chart Speed 25mm/s	
			9	Chart Speed 50mm/s	
			0	Leads are printed in format 4 * 3(25mm/s) + 1 rhythm(25mm/s)	

Automatic Mode (ECG) Settings

Average Cycles

The Average cycles are defined as follows:

Note: Lead selection for the rhythm lead(s) are defined on page 27

Average Cycles (interpretation option only)					
Entry Key Sequence				*Printout*	*Confirm*
ALT	1 or 2	2	5	No average lead cycles are printed	Press STOP key
			6	4 x 3 (25 mm/s) + 2 rhythm leads (25mm/s). The average complexes are printed in 4 groups of three leads at a chart speed of 25mm/s	
			7	4 x 3 (50 mm/s) + 2 rhythm leads (25mm/s). The average complexes are printed in 4 groups of three leads at a chart speed of 50mm/s	
			8	2 x 6 (50 mm/s) + 2 rhythm leads (25mm/s). The average complexes are printed in 2 groups of six leads at a chart speed of 50mm/s	

Automatic Mode (ECG) Settings

Measurements and Markings (C version only)

To define the measurements and markings proceed as follows:

Measurements (Interpretation Option Only)					
Entry Key Sequence				*Printout*	*Confirm*
ALT	1 or 2	3	5	Detailed table of measurement results omitted - however, the values of electrical axes, intervals, and heart rate are not suppressed.	Press STOP key
			6	Detailed table of measurement results is printed	
			7	Referenece markings are omitted	
			8	Reference markings (beginning and end of P wave and QRS, and end of T wave) are added to the ECG average cycles	

Automatic Mode (ECG) Settings

Interpretation (C version only)

To print or suppress interpretation statements on the printout proceed as follows:

Interpretation (Interpretation Option Only)					
Entry Key Sequence				*Printout*	*Confirm*
ALT	1 or 2	4	5	Interpretation is omitted	Press STOP key
			6	Interpretation is printed	

Confirm the selection by pressing **STOP**

Full details of the interpretation option are given in the SCHILLER ECG Measurement and Interpretation booklet (art. No. 2.510 179).

Interpretation Settings (C version only)

The interpretation settings enable the user to determine whether or not certain comments will be added to the interpretation statements on the ECG printout. Furthermore, the patient's age can be defined (<30 or >30) and if low or high sensitivity should be applied. Low sensitivity will suppress certain nonspecific ECG diagnosis; this may be advisable when carrying out ECGs for screening.

Interpretation Settings				
Entry Key Sequence			*Setting*	*Confirm*
ALT	6	1	"Normal" / "Abnormal" is not printed	Press STOP key
		2	"Normal" / "Abnormal" is printed	
		3	"Unconfirmed report" is not printed	
		4	"Unconfirmed report" is printed	
		5	Patient age assumed to be < 30	
		6	Patient age assumed to be > 30	
		7	Low sensitivity	
		8	High sensitivity	

Note: The 'Patient age assumed to be..' setting is only applicable when patient data has not been entered.

Automatic Mode Settings

Selecting Rhythm Leads

The rhythm leads are printed out as defined. Two separate rhythm leads can be selected. The following formats can be set:

Rhythm Leads (interpretation option only)		
Entry Key Sequence		*Setup Format*
ALT	3	Define Rhythm lead one
	4	Define Rhythm lead two

The 2 rhythm leads are defined as follows:

Extremity Leads					
Entry Key Sequence				*Lead*	*Confirm*
ALT	3 or 4	8	1	I	Press STOP key
			2	II	
			3	III	
			4	aVR	
			5	aVL	
			6	aVF	

Precordial Leads					
Entry Key Sequence				*Lead*	*Confirm*
ALT	3 or 4	9	1	V1	Press STOP key
			2	V2	
			3	V3	
			4	V4	
			5	V5	
			6	V6	

Confirm the selection by pressing **STOP** .

Memory and Data Transmission Option

Safety Notices

WHEN NON-MEDICAL DEVICES ARE CONNECTED TO THE RS-232 INTERFACE ENSURE THAT BOTH UNITS ARE SECURELY CONNECTED TO THE SAME EARTH POTENTIAL.

WHEN OPERATING THE UNIT ON BATTERY AND SIMULTANEOUSLY USING NON-MEDICAL DEVICES, THE RS-232 INTERFACE MUST BE FULLY ISOLATED.

AN EXTERNAL DEVICE MUST ONLY BE CONNECTED USING THE ORIGINAL SCHLLER INTERFACE CABLE ASSEMBLY.

The memory option allows approximately 45 recordings (dependent on size and parameters specified when the recording was taken) to be stored and transmitted over the RS-232 interface. When no more recordings can be stored the message `MEMORY FULL` is displayed. Old recordings must be deleted or transmitted before further recordings can be stored. A number of memory settings can be made as follows:

Note: At the time of print it is not possible to read or to delete individual stored recordings.

Auto Storage and Auto Erase

Memory Setup				
Entry Key Sequence				*Save Mode*
ALT	0	5	0	Auto save off
			1	Auto save on
			2	Auto erase off
			3	Auto erase on

With `auto save on`, all *auto* mode recordings, will be automatically stored on completion.

With `auto erase on`, all stored recordings are erased after sending over the RS-232 interface.

Memory and Data Transmission Option

Manual Storage

When auto save is set to off, the following message is displayed after an *auto* mode ECG.

STORE CURRENT RECORDING?
YES / NO

Use the arrow keys to select yes or no and press the ENTER key.

When YES is selected the message `STORING` appears in the message box (under the date and time box), during the storage process.

To store the current recording at any time, press the ALT key followed by the key `S`.

ALT + `S`

Displaying Memory Files

To display the contents of the memory press the ALT key followed by the key 'M'.

ALT + `M`

Reading and Printing a Stored File

- **Enter the memory mode - press the ALT key followed by the key 'M'.**

  ALT + `M`

- **Select an ECG using the cursor keys.**

  ⇐⇑⇒⇓

- **Read the selected ECG - press and hold the ALT key and then press key `R `.**

  ALT and `R`

- **Obtain a printout - press Copy key.**

Erasing Memory Files

To erase the contents of the memory (delete all files), press and hold the ALT key and then press key `E `.

ALT and `E`

ERASE ALL?
YES / NO

When YES is selected the message `ERASING` appears in the message box (under the date and time box), during the erasing process.

Memory and Data Transmission Option

Transmitting Stored Files

The contents of the memory can be transmitted to the SEMA-200 data management program, either directly using the RS-232 connector of the computer, or over the telephone system. Sending directly is termed LINE transmission; sending over the telephone system requires a modem and this form of sending is termed MODEM.

Transmission Settings

The speed settings options for the AT-2plus are as follows:

Serial Communication Interface					
Entry Key Sequence					*Transmission Speed*
ALT	0	9	1	0	115200
				1	57600
				2	38400
				3	28800
				4	19200
				5	14400
				6	9600

The mode of transmission is as follows:

Communication Mode					
Entry Key Sequence					*Mode*
ALT	0	9	2	1	line
				2	modem

Line Transmission

To transmit directly over line as follows

Set Communication mode to LINE - key sequence:

Connect the cable assembly (optional accessory, art. No. 2.310 159) between the RS-232 connector on the AT-2plus and the COM interface of your Computer.

Ensure that the SEMA communication program (SEMACOMM) is active on the computer (see SEMA handbook).

Press and hold the ALT key and then press key `T `.

Memory and Data Transmission Option

Modem Transmission

To transmit over the telephone network proceed as follows

Set Communication mode to MODEM - key sequence:

ALT 0 9 2 2

Enter Phone number - key sequence:

ALT 0 9 3 2

the following is displayed:

Phone No.
T, 0417608787
Modem Initialization
ATBOL1VOQ0E0S0=0

ATBOL3VOQ0S0=08D2

Enter the telephone number preceded by `P` or `T` (tone or pulse).

A comma `,` gives a one second pause in dialing - this may be necessary if for example a outside line is required.

Enter the modem initialisation codes. Full details will be found in the user guide for your modem. However, the modem initialisation must contain at the minimum, the following commands with the prefix `AT`.

`Q0`- modem sends response

`V0`- numerical response codes

`E0`- no command echo

The standard modem initialisation code is: ATB0L1V0Q0E0S0=0

Press the patient key to store settings.

Connect the modem cable assembly (supplied with modem) between the RS-232 connector on the AT-2plus and the modem

Ensure that the SEMA communication program (SEMACOMM) is active on the computer (see SEMA handbook).

Press and hold the ALT key and then press key `T `.

ALT and `T`

The message `TRANSMITTING` appears while the unit is sending in the message box (under the date and time box)

If a transmission error occurs the message `Tx ERROR` is displayed.

Check all settings in the SEMACOMM program (baud rate; parity - none; stop bit - 2; time between blocks, records - 100ms).

Check that the transmission speed is the same in both the AT-2plus and the SEMACOMM program.

To stop transmission press and hold the ALT key and then press key `Q`.

ALT and `Q`

Care & Maintenance

Self-test

Initiate a self-test of the AT-2*plus* as follows:

Self Test				
Entry Key Sequence				*Action*
ALT	0	3	3	Service Data Displayed

A table giving information for the service staff is displayed.

To obtain a printout press `P` when the table is displayed. Exit this screen by pressing the ENTER key.

12 Monthly Check

The unit should undergo a technical safety check every 12 months. This safety check should include the following:

- Visual inspection of the unit and cables.
- Electrical safety tests according to IEC 601-1 and IEC 601-2-25.
- Functional tests according to the Service Handbook.

The test results must be documented.

Cleaning the Casing

CAUTION: SWITCH THE UNIT OFF BEFORE CLEANING AND DISCONNECT THE MAINS. DO NOT, UNDER ANY CIRCUMSTANCES, IMMERSE THE APPARATUS INTO A CLEANING LIQUID OR STERILIZE WITH HOT WATER, STEAM, OR AIR.

The casing of the AT-2*plus* can be cleaned with a soft damp cloth on the surface only. Where necessary a domestic non-caustic cleaner can be used for grease and finger marks.

Care & Maintenance

Cleaning the Patient Cable

ALIGN THE LEADS IN SUCH A WAY AS TO PREVENT ANYONE STUMBLING OVER THEM OR ANY DAMAGE CAUSED BY THE WHEELS OF INSTRUMENT TROLLEYS.

The patient cable should not be exposed to excessive mechanical stress. Whenever disconnecting the leads, hold the plugs and not the cables. Store the leads in such a way as to prevent anyone stumbling over them or any damage being caused by the wheels of instrument trolleys.

The cable can be wiped with soapy water. Sterilization, if required, should be done with gas only and not with steam. To disinfect, wipe the cable with hospital standard disinfectant.

Cleaning the Thermal Print Head

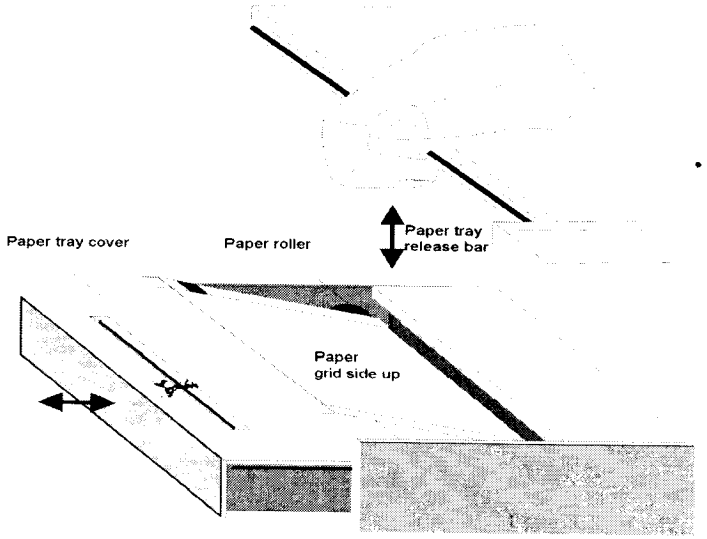
If the printer is used a lot, a residue of printers ink (from the grid on the paper) can build up on the print head. This can cause the print quality to deteriorate. We recommend therefore that every month the print head is cleansed with alcohol as follows:

Remove the paper tray. The thermal printhead is found under the paper tray release catch.

With a tissue dampened in alcohol, gently rub the printhead to remove the ink residue. If the printhead is badly soiled, the colour of the paper grid ink (i.e. red or green) will show on the tissue.

Replacing the Recording Paper

The recording paper must be replaced as soon as the end of the paper is indicated by a red stripe on the lower edge. After the indication first appears, there are about 8 pages left. However, we recommend that the paper be replaced immediately. If no paper is left, the printing process is interrupted and a warning is given on the screen. To replace the paper proceed as follows:



Replacing the Recording Paper

- **Place fingers under the retaining bar and pull directly upwards. The paper tray cover releases.**
- **Withdraw the cover from the unit. DO NOT FORCE, THE PAPER TRAY COVER RUNS FREELY OVER THE DEDICATED RUNNERS.**
- **Remove any remaining paper from the paper tray.**
- **Place a new paper pack into the paper tray with the printed (grid) side facing upwards.**
- **Place the beginning of the paper over the black paper roller on the paper tray cover.**
- **Return the paper tray cover in position and press firmly until secure.**
- **Press the STOP key to transport the paper to the start position.**

SCHILLER can only guarantee perfect printouts when SCHILLER original chart paper or chart paper of the same quality is used.

Thermal Paper Handling

The thermal paper used in the AT-2*plus* requires slightly different handling to normal paper as it can react with chemicals and to heat. However, when the following points are remembered, the paper will give reliable results:

The following points apply to both storage, and when archiving the results.

1. Before use, keep the paper in its original cardboard cover. Do not remove the cardboard cover until the paper is to be used.
2. Store in a cool, dark and dry area.
3. Do not store near chemicals e.g. sterilisation liquids.
4. In particular do not store in a plastic cover.
5. Certain glues can react with the paper - do not attach the printout onto a mounting sheet with glue.

Fault Diagnosis

Unit does not switch on, Blank Screen

Green mains indicator on?

No? Check mains supply.

Yes? Check contrast with the UP/DOWN cursors keys

If mains is OK and the screen is still not lit:

Press the OFF key

Wait a few seconds and switch on again.

If the screen is still not lit: Call your local SCHILLER representative.

QRS traces overlap

Ensure that the automatic sensitivity reduction is not switched off.

Reset signals to baseline - press the 1mV key

Check electrode contact

'Noisy' traces

Check electrode contact

Reapply electrodes

Ensure that the patient is relaxed and warm

Check all filter settings.

Activate Myogram filter - change cutoff frequency

Ensure mains filter is correct for mains supply

No printout obtained after an auto mode recording

Ensure that paper is loaded.

Check Settings - ensure that at least one item is selected for print after an auto ECG is recorded

Contact your local SCHILLER representative.

Fault Diagnosis

Printout fades or is not clear

Ensure that fresh SCHILLER paper is installed.

Note that the thermal paper used for the AT-2*plus* is heat and light sensitive. If is not stored in its original seal, stored in high temperatures or is simply old, print quality can deteriorate.

Ensure that the paper has been installed correctly with the paper mark at the top.

Over a period of time, the printing ink from the grid on the paper can form a film on the thermal print head. Clean the thermal print head with a clean cloth as described previously.

If the problem persists call your local SCHILLER representative.

No printout of interpretations statement or measurements

Check that the interpretation and measurement options are enabled for the printout.

No key response, LCD locked

Switch off, and switch on again after a few seconds

Ordering Information

Your local representative stocks all the disposables and accessories available for the AT-2*plus*. In case of difficulty or to obtain the address of your local dealer, please contact the head office. Our staff will be pleased to help process your order or to provide any details for all SCHILLER products.

DESCRIPTION	*PART-NO.*
10-lead Patient Cable, Standard	*2.400 070*
10-lead Patient Cable, USA	*2.400 071*
Electrodes (box of 500 clip electrodes)	*2.155 031*
Mains (Power) Cable (Germany)	*2.300 005*
Mains (Power) Cable (Switzerland)	*2.300 003*
Mains (Power) Cable (USA)	*2.300 001*
Potential Equalisation (Ground) cable	*2.310 005*
Recording Paper, Z-folded	*2.157 017*

*AT-2*plus *User Guide - English , German, French*	*2. 510 220*
*AT-2*plus *User Guide - Italian*	*2. 510 223*
*AT-2*plus *User Guide - Spanish*	*2. 510 224*
*AT-2*plus *User Guide - Portuguese*	*2. 510 225*
*AT-2*plus *User Guide - Russian*	*upon request*
Software (C) Interpretation	*5. 025 002*
Guide to the Interpretation and Measurements Program (English /German / French)	*2.510 179*

Technical Data

Technical data subject to change without notice.

Dimensions	400 x 330 x 100 mm
Weight	5.0 kg (5.35 kg with full paper tray)
Mains Supply	100 to 115 / 220 to 240 VAC, 50/60 Hz
Battery	Built-in 12 V lead-acid battery (rechargeable)
Battery Capacity	4 hours normal use - 300 printouts
Power Consumption	Recording: 40 VA max
Leads	Standard / Cabrera
Paper Speed	5 / 10/ 25 / 50 mm/s (direct)
Sensitivity	5 /10 / 20 mm/mV, either automatically adjusted or manually selected
Chart Paper	Thermoreactive - Z-folded, 210 mm wide, perforation 280 mm
Printing Process	High-resolution thermal print head,
	8 dots per mm / 200 dots per inch (amplitude axis)
	40 dots per mm / 1000 dots per inch (time axis 25mm/s)
Recording Tracks	6 channels, positioned at optimal width on 200 mm, automatic baseline adjustment
Automatic Lead Programs	
	Printout of all 12 leads
Data Record:	Listing of ECG recording data
	Version C: ECG measurement results (intervals, amplitudes, electrical axes), Sokolow Index, average complexes with optional measurement reference markings, and interpretation.
ECG Storage:	Circular input memory for 10 s, 12-lead ECG.
Memory Option:	Memory for c.45 ECG recordings with transmission facilities over an RS-232 interface.
Frequency Range of Digital Recorder:	
	0 to 150 Hz (IEC)
	0 to 150 Hz (AHA)

English

Technical Data

ECG Amplifier: Simultaneous, synchronous registration of all 9 active electrode signals (= 12 standard leads)

Sampling frequency: 1000 Hz

Digital resolution: 5 µV

Dynamic range: ±9.5 mVAC

Max. electrode potential: ±300 mVDC

Time constant: 3.2 s

Frequency response: 0.05 to 150 Hz (-3 dB)

Input impedance:
>2.5MOhms at 10Hz

Myogram Filter (muscle tremor filter)

25 Hz or 35 Hz, programmable (not active on averaged waveform). The stored ECGs can be printed with or without filter.

Line Frequency Filter: Distortion-free suppression of superimposed 50 or 60 Hz sinusoidal interferences by means of an adaptive digital filter.

Patient Input: Fully floating and isolated, defibrillation protected.

Safety Standard: CF according to IEC and complying with the following

RL 93/42/EEC

EN 60601-1:1990

IEC 601-1

IEC 601-2-25:1993

pr EN 1441:1994

EMC: CISPR 11: 1985, EN 55011: 1992

IEC 801-2: 1991

IEC 801-3: 1984

IEC 801-4: 1988

IEC 801-5:

Safety Class: I according to IEC 601-1 (with internal power supply)

IIa according to RL 93/42/EEC, CE-0123

This device is not designed for outdoor use (IP 20)

Technical Data

Environmental Conditions:

Temperature, Operating: 10° to 40°C

Temperature, Storage: -10° to 50° C

Relative humidity: 25 to 95% (non condensing)

Atmospheric pressure: 700 to 1060 hPa

Control Panel: Rubber keys

Technical data subject to change without notice.

Available Configurations

The CARDIOVIT AT-2*plus* is available in two versions:

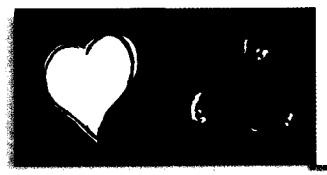
Standard Version: Unit with ECG recording and printout capabilities.

Version C: Unit with additional ECG Interpretation program (including measurements).

Innovative Technology from SCHILLER

- Resting ECG
- Exercise ECG
- PC ECG
- Holter ECG
- ECG Interpretation
- Cardiopulmonary Exercise Testing
- Patient Monitoring
- Pulmonary Function Testing (Spirometry)
- Data Management
- Ambulatory 24-Hour Blood Pressure
- Telemedicine
- Ultrasound Doppler
- Defi Family

CE



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The Art of Diagnostics

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