

## 698 Autosampler

Series 5...



 **Metrohm**

Measurement in Chemistry

**METROHM Ltd.**  
**CH-9101 Herisau**

Switzerland  
Phone 071/53 11 33  
Telefax 071/52 11 14  
Telex 88 27 12 metr ch



# 698 Autosampler

Series 5 ...

## Mains connection:

Mains voltage	$U$	= 100, 120, 220, 240 V $\pm$ 10%
Mains frequency	$f$	= 50 ... 60 Hz
Power consumption	$S$	= 55 VA

**8.698.1013 Instructions for use**



# 8.698.1013 Instructions for Use

## 698 Autosampler

---

### Table of Contents

	<u>Page</u>
<b>1. Introduction</b> .....	<b>1</b>
<b>2. Control elements</b> .....	<b>2</b>
<b>3. Installation and initial checkout</b> .....	<b>4</b>
3.1. Setting up the instrument .....	4
3.2. Connection of the 690.0020 Ion Chromatograph .....	4
3.2.1. Tubing connection .....	4
3.2.2. Electrical connections .....	5
3.3. Mains connection and switching on the instrument .....	6
3.4. Initial checkout .....	6
<b>4. General description</b> .....	<b>8</b>
4.1. Theory of operation .....	8
4.2. Display .....	8
4.3. Keypad .....	9
4.3.1. Dialogue mode .....	10
4.3.2. Function mode .....	12
<b>5. Operation</b> .....	<b>15</b>
5.1. Loading sample vials .....	15
5.2. Control settings .....	15
5.2.1. Power .....	15
5.2.2. Programming dialogue .....	15
5.2.3. Running a program .....	16
5.2.4. Stopping a run .....	17
5.3. Manual operation .....	17
5.4. Operation summary .....	17
<b>6. Maintenance, malfunctions</b> .....	<b>19</b>
6.1. Routine maintenance .....	19
6.1.1. Sample preparation .....	19
6.1.2. Self-Test .....	19
6.2. Needle replacement .....	19
6.3. In case of difficulty .....	20
6.3.1. Non-reproducible injections .....	20
6.3.2. Leaking injector valve .....	20
6.3.3. Missed injections .....	20
6.4. Error messages .....	21

	<u>Page</u>
<b>7. Technical data</b> .....	<b>22</b>
7.1. Technical data of the 698 Autosampler .....	22
7.2. Accessory power control connector .....	23
7.3. Valve connector .....	23
7.4. Terminal strip connector .....	24
7.5. RS 232C interface .....	25
7.5.1. General information .....	25
7.5.2. Command codes and program example .....	26
<b>8. Scope of delivery and ordering designations</b> .....	<b>29</b>
8.1. 698 Autosampler .....	29
8.2. Options .....	29
<b>9. Warranty</b> .....	<b>30</b>
<b>10. Index</b> .....	<b>31</b>

### List of Figures

	<u>Page</u>
Fig. 1: 698 Autosampler with 690 Ion Chromatograph and 697 IC Pump .....	1
Fig. 2: Front and rear of the 698 Autosampler .....	2
Fig. 3: PVDF compression fitting .....	4
Fig. 4: Connection of the 698 Autosampler at the injection valve of the 690 Ion Chromatograph ..	5
Fig. 5: Connection scheme 698 Autosampler / 690 Ion Chromatograph / Integrator .....	5
Fig. 6: Vial dimensions and injector deliveries .....	9
Fig. 7: Keypad .....	10
Fig. 8: Needle removal procedure .....	19
Fig. 9: Pin assignments for the accessory power control connector .....	23
Fig. 10: Pin assignments for the valve connector .....	23
Fig. 11: Injector valve interface .....	23
Fig. 12: Pin assignments for the Terminal Strip connector .....	24
Fig. 13: Jumper location .....	25
Fig. 14: Pin assignments for the RS 232C connector .....	26

### List of Tables

	<u>Page</u>
Table 1: Description of keys .....	13
Table 2: List of HELP MESSAGES .....	14
Table 3: Dialogue description .....	18
Table 4: Start Key dialogue .....	18
Table 5: ASCII equivalents of front panel keys .....	26

# 698 Autosampler

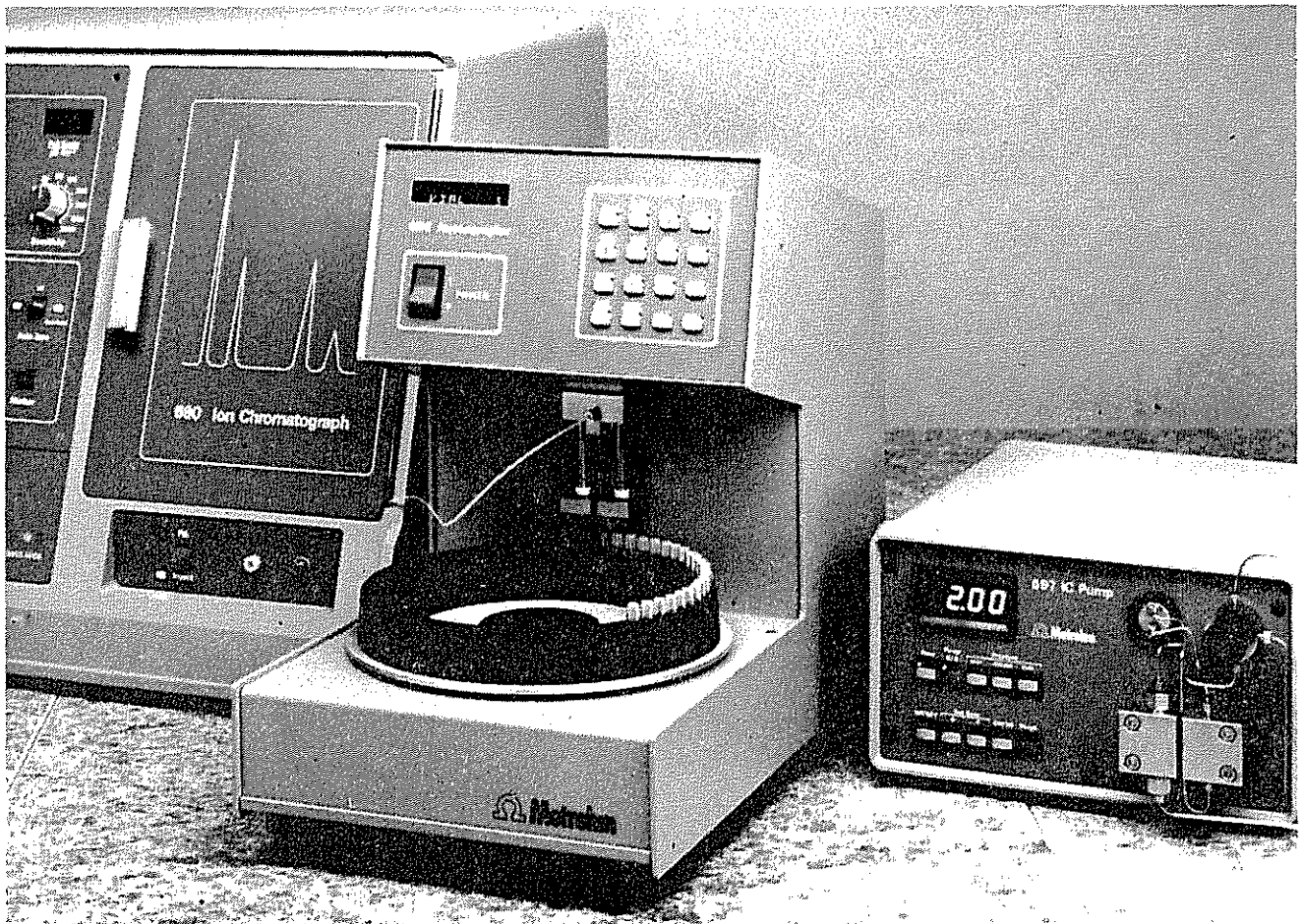
## *Instructions for Use*

### 1. Introduction

The **698 Autosampler** is a microcomputer-operated sampling/controller system designed to be used with the 690.0020 or 690.0030 Ion Chromatograph. It has a capacity of 64 samples, which are transferred into the sample loop of the electrically operated injection valve of the 690.0020 or 690.0030 Ion Chromatograph.

The 698 Autosampler performs **repetitive injections at user-selectable time intervals**. All operating parameters are entered from the front panel. Additionally, the instrument can be controlled remotely either by an external programmable contact closure or through the RS 232 connector located on the rear panel.

The 698 Autosampler should **not be used with strong acids, bases, or concentrated solutions of acidic or basic salts**. Both sample and mobile phase should be well filtered through at least a **0.45  $\mu\text{m}$  filter**. Otherwise, particulate matter can plug the needle or the transfer tubing and can permanently damage the injector valve.



**Fig. 1:** 698 Autosampler with 690 Ion Chromatograph and 697 IC Pump

## 2. Control elements

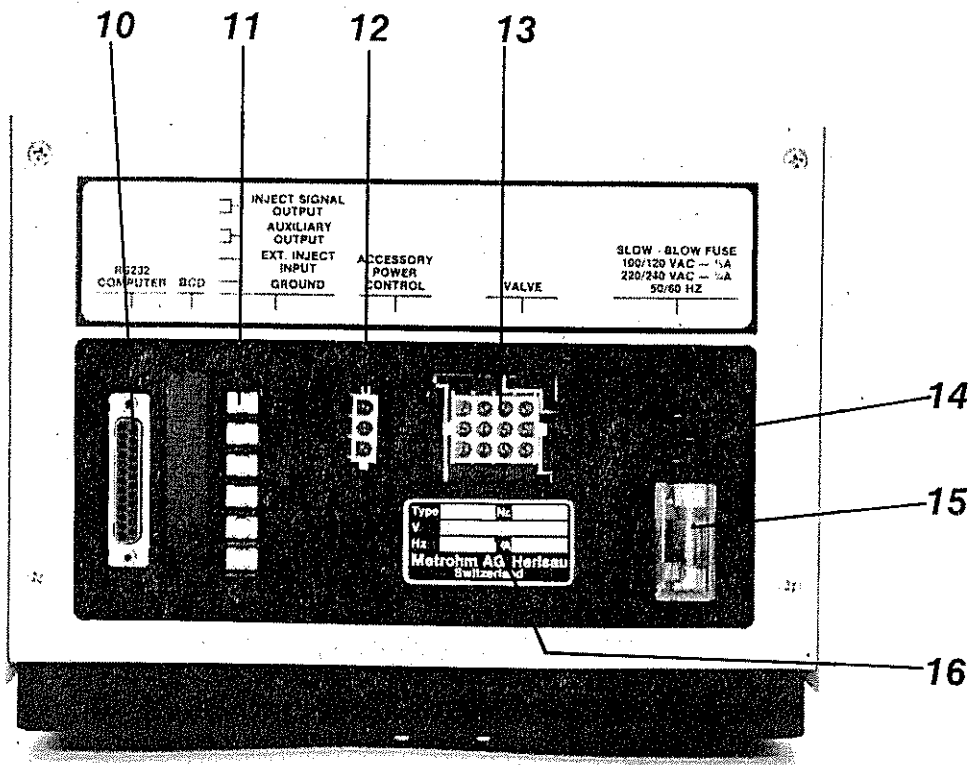
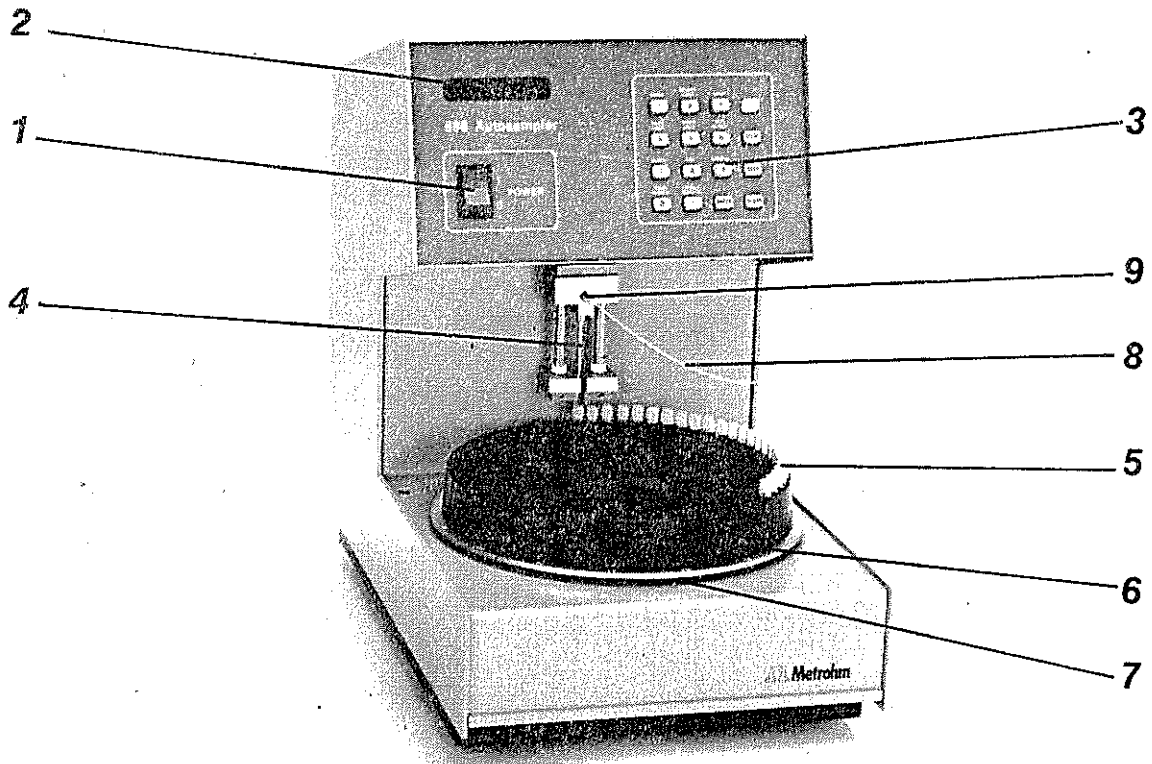


Fig. 2: Front and rear of the 698 Autosampler

- 1 **ON/OFF**  
Switching the instrument on and off (mains switch): 1 = ON 0 = OFF  
Operational readiness is shown by lighting up of the LED display (2).
- 2 **LED display** (8 characters)
- 3 **Keypad** (for details, see Section 4.3)
- 4 **Needle**
- 5 **Vial**
- 6 **Quadrant (sample vial holder)**
- 7 **Turntable**
- 8 **PTFE Microcapillary tubing**  
for the connection of the 698 Autosampler with the injector of the 690 Ion Chromatograph
- 9 **Connection for microcapillary tubing (8)**
- 10 **RS 232C interface** (for details, see Section 7.5)
- 11 **Terminal strip connector with the outputs "Inject signal", "Auxiliary output", "External output" and "Ground"** (for details, see Section 7.4)
- 12 **Accessory power control connector** (for details, see Section 7.2)
- 13 **Valve connector** (for details, see Section 7.3)
- 14 **Mains connection**  
Cold appliance plug, type CEE(22), VI
- 15 **Voltage selection and fuse connection window**  
(mains voltage alteration and fuse replacement, see Section 3.3)
- 16 **Rating plate**
  - 1<sup>st</sup> line: Specification of the model, serial and instrument number.  
In any inquiry to METROHM Switzerland or your national METROHM agency, all these numbers must be quoted in full!
  - 2<sup>nd</sup> line: Mains voltage data
  - 3<sup>rd</sup> line: Mains frequency and power consumption data

### 3. Installation and initial checkout

---

#### 3.1. Setting up the instrument

The 698 Autosampler is supplied together with the separately packed accessories in a special package designed to afford maximum protection. These contain shock-absorbent foam liners foamed to the individual shape and wrapped in blue plastic sheeting. The instrument itself is packed in an evacuated, dustproof polyethylene bag. It is advisable to keep the special packaging since it alone ensures that the instrument suffers no damage if it has to be returned.

Immediately after receipt of the shipment, visually inspect the 698 Autosampler and its accessories to ensure all items have been received and none has sustained physical damage (compare with delivery note and accessories list in Section 8). If transport damage has occurred, see instructions in Section 9 "Warranty".

The 698 Autosampler should be set up in the laboratory at a location suitable for operation, free from vibration and protected from any corrosive atmosphere and contamination by chemicals. The 698 Autosampler should be in close proximity to the automatic injection valve of the 690.0020 Ion Chromatograph so that the maximum percentage of sample is available to the loop.

#### 3.2. Connection of the 690.0020 or 690.0030 Ion Chromatograph

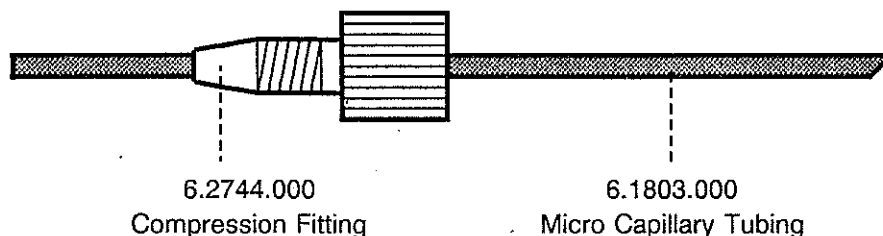
##### 3.2.1. Tubing connection

The 6.1803.000 PTFE microcapillary tubing (int. diam. = 0.3 mm, ext. diam. = 1.5 mm, length = 1 m) is used to connect the 698 Autosampler with the injection valve of the 690.0020 or 690.0030 Ion Chromatograph. In order to avoid excessive dead volume, the tubing should be cut by means of a razor-blade to provide the shortest distance between the Autosampler needle and the valve.

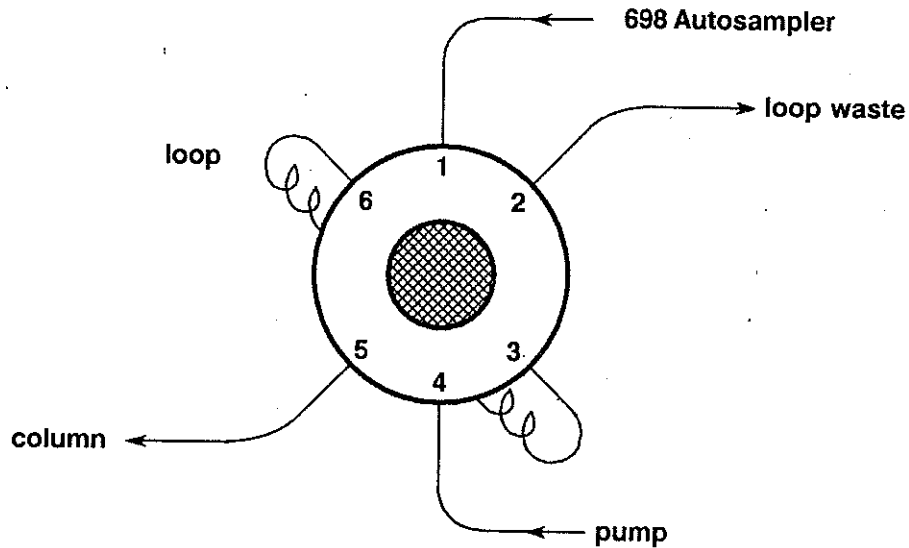
Two 6.2744.000 PVDF compression fittings are now mounted on both ends of the microcapillary tubing (see Fig. 3). The prepared microcapillary (8) is then screwed onto connection (9) at the front of the 698 Autosampler (see Fig. 2) and inserted in the column compartment either through one of the openings (29-690) at the rear of the 690 Ion Chromatograph or through the door crack in the lower right corner of door (13-690). After removing the steel capillary leading to the syringe connection (16-690) of the 690 Ion Chromatograph, the other end of the microcapillary (8) is screwed onto connection 1 of the injection valve (see Fig. 4).

Tighten the PVDF compression fittings by hand (use no tools!). To avoid dead volumes, the end of the capillary must always be pushed completely into the appropriate connection.

The microcapillary tubing can be fixed at the instrument by aid of the Y.107.0150 self-adhesive hose clip.



**Fig. 3:** PVDF compression fitting

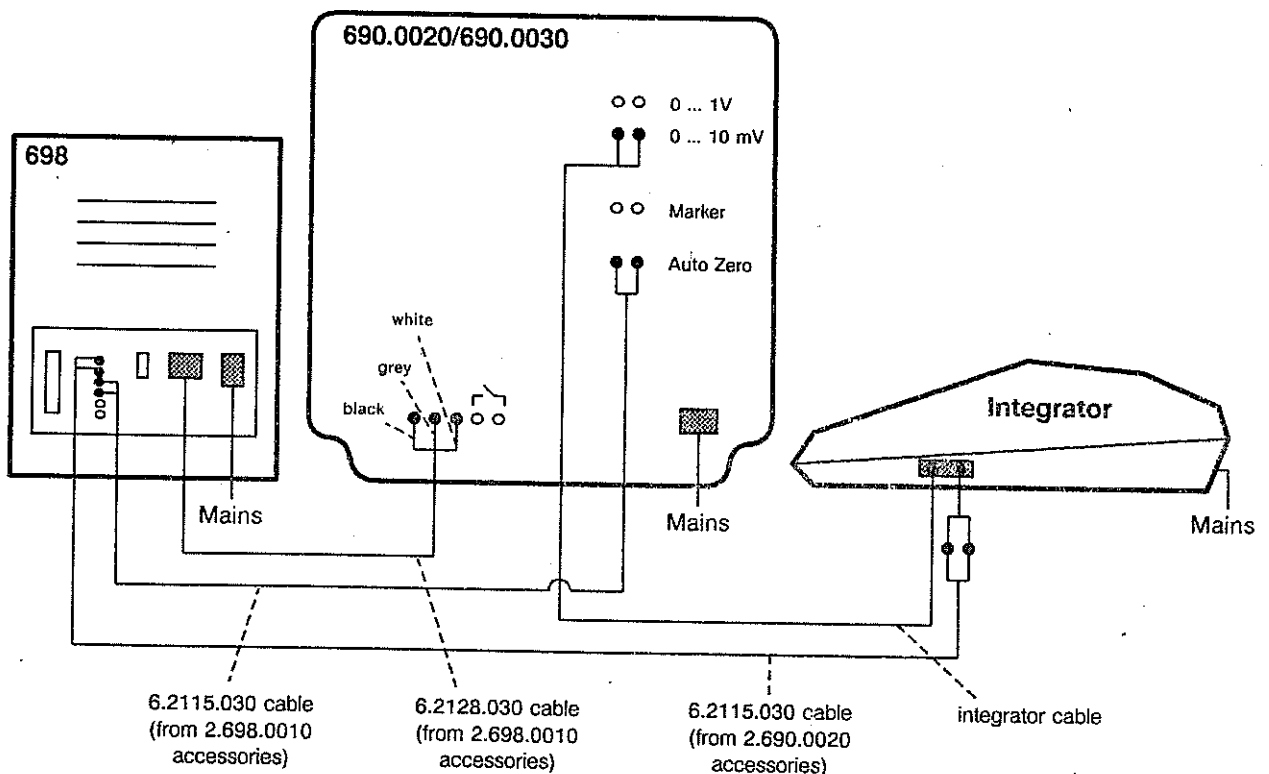


**Fig. 4:** Connection of the 698 Autosampler at the injection valve of the 690 Ion Chromatograph

It is also possible to connect 2 Ion Chromatographs (e.g. one with an anion and one with a cation column) to the same 698 Autosampler. For this, connection 2 (loop waste) of the injection valve of the first 690 IC (see Fig. 4) has to be connected to connection 1 (loop inlet) of the injection valve of the second 690 IC by means of an additional 6.1803.000 PTFE microcapillary tubing cut to the appropriate length. The two sample loops connected in this manner are both filled at the same time by one injection of the 698 Autosampler.

### 3.2.2. Electrical connections

The 698 Autosampler is connected to the 690 Ion Chromatograph and the integrator according to the following connection scheme (Fig. 5), whereby the cables listed in the diagram have to be used. At the 690.0030 Ion Chromatograph, there are three possibilities to connect the 698 Autosampler by aid of the 6.2128.030 cable: *A/B (50-690)*, *A (49-690)* or *B (48-690)* connector block.



**Fig. 5:** Connection scheme 698 Autosampler / 690 Ion Chromatograph / Integrator

### 3.3. Mains connection and switching on the instrument

Before the 698 Autosampler is switched on for the first time, the correct setting of the mains voltage and fuse must be checked. The mains voltage set on the instrument will be visible inside the small clear plastic window (15) (see Fig. 2). If the voltage must be reset, proceed as follows:

1. Unplug the mains cable.
2. Slide the plastic cover (15) up.
3. Rotate FUSE-PULL upwards and remove fuse.
4. Withdraw the small printed circuit card. The voltages which can be chosen are written on this card (100, 120, 220, 240 V).
5. Orient this card so that the appropriate voltage will be visible when the card is reinserted and reinsert the card by pushing it firmly into the module slot.
6. Rotate FUSE-PULL back into normal position.
7. Compare the fuse specifications with the data on the rear panel and insert the appropriate fuse:

100/120 V: 0.5 A (order no. U.600.0504)  
220/240 V: 0.25 A (order no. U.600.0503)

8. Slide the plastic cover (15) down and install the mains cable.

The instrument is supplied with one of three mains cables:

6.2122.020	with plug	SEV 12 (Switzerland ...)
6.2122.040	with plug	CEE(7), VII (Federal Republic of Germany ...)
6.2122.070	with plug	NEMA/ASA (USA ...)

which are three-core and equipped with a plug with earthing pin. If a different plug has to be fitted, the yellow/green lead (IEC standard) must be connected to the protective earth. The mains cable is plugged into connection socket (14).

The instrument is switched on using mains switch (1) at the front: 1: ON 0: OFF  
Operational readiness is shown by lighting up of the LED display (2).

### 3.4. Initial checkout

**Note:** The following notation convention is used in this manual:

- Words written in capitals, e.g. VIAL, indicate what is shown on the 698 Autosampler display.
- Underlined numbers, e.g. 01, indicate the numerical value entered into a program by pressing number keys.
- Words written in capitals and surrounded by brackets, e.g. <ENTER>, indicate which key to press.
- The keys are labeled on the keyface or in white letters above the key for special functions.

Initial checkout will prove the general operation of the instrument and show that no shipping damage or installation problem exists which would prevent normal operation. This procedure assumes all connections specified in Sections 3.1 to 3.3 are made.

The vial-holding quadrants should not be installed at this time. Remove the four quadrants if they are mounted on the turntable. The turntable may be rotated manually to gain access to the quadrant beneath the needle.

Shift the POWER switch (1) to the "1" or ON position. After the display shows SELFTEST, the vial position currently located under the needle should be shown on the display. Follow the sequence of instructions below to check the action of the needle, turntable, and injection valve.

**Step 1** Automatically rotate the turntable to vial position 1 by using the following sequence of keys:

```
<START>  
INIT V 1 <ENTER>
```

The turntable will move to position number 1. Press <STOP>. The display will read  
VIAL 1

**Step 2** Press the white function key, then press <LOAD LOOP>. The injection valve will rotate to the LOAD (Fill) position if it is not currently in that position. The needle will descend to the first of three injection positions.

**Step 3** Press the white function key, then press <INJECT>. The valve will rotate to the INJECT position.

**Step 4** Press the white function key, then press <RAISE NEEDLE>. The needle will ascend to the upper or HOME position.

**Step 5** Program the Autosampler to make one injection per vial with a time between injections of 1 min starting with vial number 1 and ending with vial number 1. The following key sequence will accomplish this:

```
<STOP>  
VIAL 1 <ENTER>  
THRU 1 <ENTER>  
INJ 1 <ENTER>  
TIME 1.0 <ENTER>  
VIAL 2
```

**Step 6** Run the program by making the following key sequence:

```
<START>  
INIT V 1 <ENTER>  
RINSE 0 <ENTER>  
LAST V 1 <ENTER>
```

The valve will rotate to the LOAD position and the needle will descend to the first of one injection position. The valve will then rotate to the INJECT position. The display will begin to cycle the following information:

```
V1 -> V01  
INJ 1/1  
TIME 0
```

The TIME parameter may either count up from 0.0 to 1.0 min or count down from 1.0 to 0.0 min (see Section 4.3.2), either is normal. The needle will retract to the HOME position and the turntable will index to the next vial position once the 1.0 minute time between injections has elapsed.

Once the above steps have been completed, connect all tubing, apply flow and check the whole IC system for leaks.

Consult Section 6, if any difficulty is encountered with any of the above tests.

## 4. General description

---

**Note:** The following notation convention is used in this manual:

- Words written in capitals, e.g. VIAL, indicate what is shown on the 698 Autosampler display.
- Underlined numbers, e.g. 1, indicate the numerical value entered into a program by pressing number keys.
- Words written in capitals and surrounded by brackets, e.g. <ENTER>, indicate which key to press.
- The keys are labeled on the keyface or in white letters above the key for special functions.

### 4.1. Theory of operation

Polypropylene sample vials (5) and polyethylene caps are included with the 698 Autosampler. Sample is loaded into a vial and the plastic cap is inserted until flush with the vial top. The vial is inserted in a quadrant (6). Loaded vials in a quadrant are placed on the turntable (7) which sequentially rotates the vials beneath the injection needle (4).

The needle descends and is forced through the plastic cap. The opening into the cap is located on the side to prevent plugging by the plastic when the cap is punctured. The needle continues downward until the needle housing contacts the area around the puncture in the cap and forces the cap downward into the vial. This piston action of the cap forces sample through the transfer line (8) and the valve sample loop, the excess flowing out the waste tube.

The 698 Autosampler can be programmed to make 1, 2, or 3 injections per vial. The number of injections depends on the sample loop size. With the 100  $\mu$ L loop supplied with the 690 Ion Chromatograph only 1 injection per vial is possible. If you want to make 2 or 3 injections per vial, use a loop  $\leq$  20  $\mu$ L.

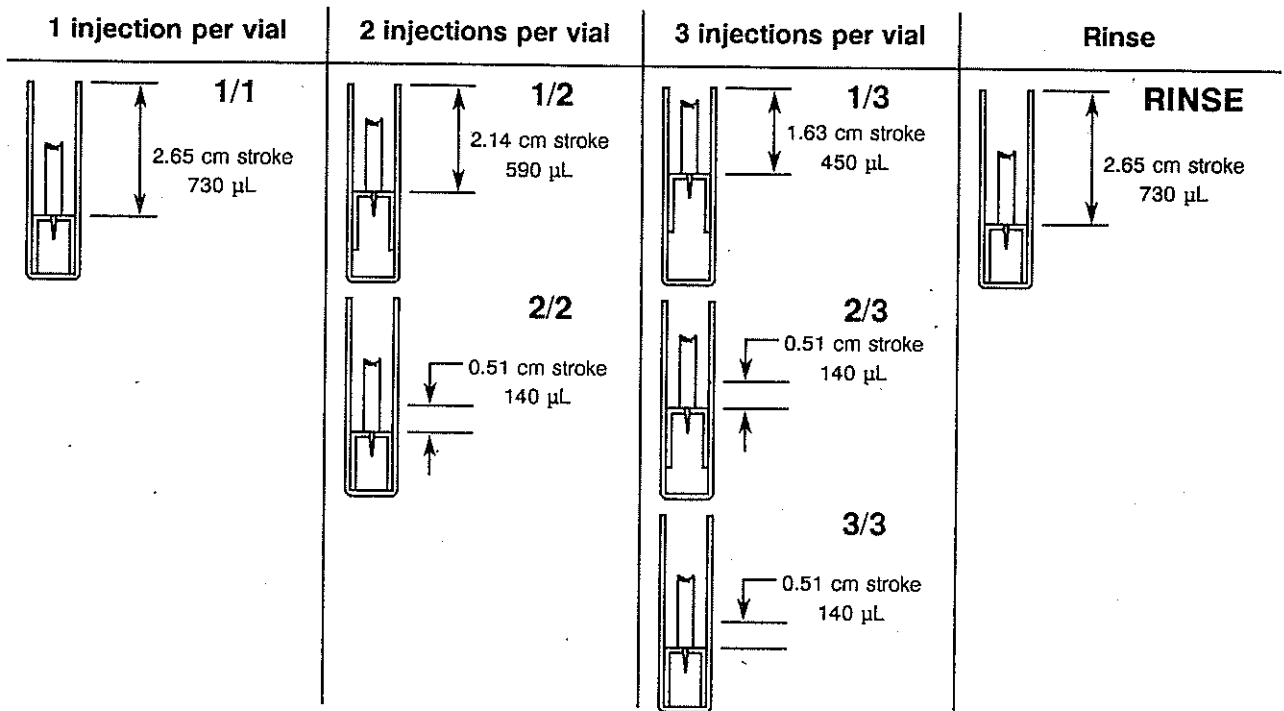
One injection per vial drives the cap downward for a 2.65 cm stroke. Volume displacement is approximately 730  $\mu$ L. The sample vial need not be filled completely. The minimum volume of sample required is 300  $\mu$ L when using the Autosampler programmed for one injection per vial.

The first stroke which occurs for a vial programmed for two injections per vial is 2.14 cm. Sample delivery is approximately 590  $\mu$ L. The second injection has a 0.51 cm stroke and sample delivery is approximately 140  $\mu$ L. The first stroke is larger than the second to provide adequate rinsing of the previous sample.

The first stroke which occurs for a vial programmed for three injections is 1.63 cm. Sample displacement is 450  $\mu$ L. The second and third injections each have strokes of 0.51 cm and deliver 140  $\mu$ L of sample. *Fig. 6* details the sample delivery action for one, two, and three injections per vial.

### 4.2. Display

The display (2) is an eight-character, scrolling, alphanumeric, light emitting diode (LED) device. It is located in the upper left corner of the front panel (see *Fig. 2*). The display indicates current vial number, injection number, rinse, time till next injection, auxiliary time, loop choice, error codes, and HELP messages. The display provides prompts to aid in programming the Autosampler in the DIA-LOGUE mode (see *Section 4.3.1*).



**Fig. 6: Vial dimensions and injector deliveries**

Four parameters are shown on the display during a programmed run. The option of showing all parameters or only one parameter is user-selectable. The default condition allows all parameters to flash, in sequence, on the display. The first parameter

VNN -> VMM

gives the current vial number, NN, and the final vial number, MM, in a programmed run sequence.

The second parameter

INJ N/M

shows the N<sup>th</sup> injection out of M injections per vial.

The third parameter

TIME NN.N

can display either the elapsed time or the time until the next injection. The method of TIME display selection is discussed in Section 4.3.2, <SPECIAL> key. The fourth parameter

AUX NN.N

gives the time until the AUXiliary timer contact closure is actuated (see Section 4.3.1). The AUX parameter is optional and is only displayed if the AUXiliary timer is enabled (see Section 4.3.2).

During a programmed run, the display can be set to show any one of the four parameters. Pressing any key on the keypad except <STOP> will select the parameter currently on the display. The default display condition (to show sequentially all the parameters) will return if any key other than <STOP> is again pressed.

### 4.3. Keypad

The sixteen button keypad (3), located on the right half of the front panel (see Fig. 2), provides direct communication to the 698 Autosampler. The keypad operates in two modes, the DIALOGUE mode and the FUNCTION mode. Fig. 7 details the keypad.

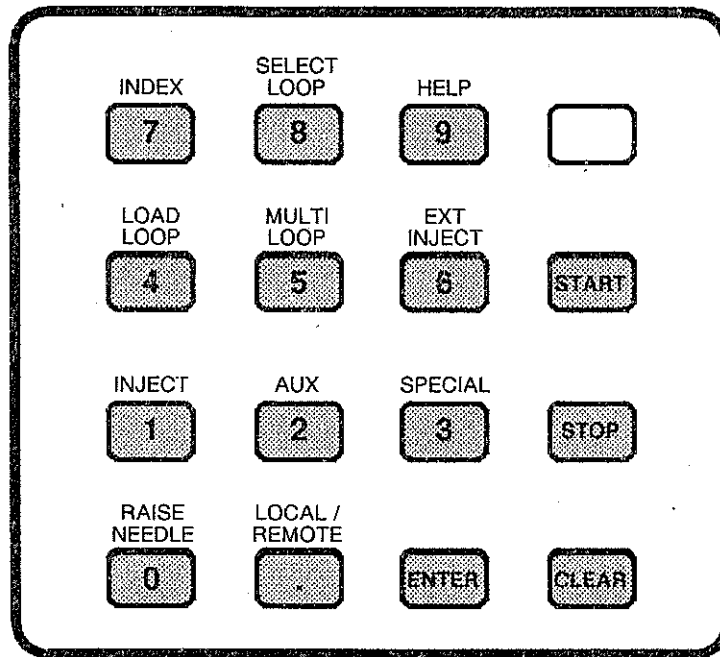


Fig. 7: Keypad

#### 4.3.1. Dialogue mode

The DIALOGUE mode permits programs to be entered into the Autosampler by providing a series of prompts on the display. The prompts are answered by entering the appropriate numerical response. The DIALOGUE mode is the normal, default mode of the keypad. The command keys used with the DIALOGUE are <ENTER>, <CLEAR>, <START> and <STOP>.

**ENTER** Passes numerical entries to the program.

**CLEAR** Permits cancellation of a numerical entry before it is ENTERed. If a wrong numerical entry has already been ENTERed, the <STOP> key must be pressed and a new DIALOGUE started. Programs may be cleared from memory by first pressing the white function key, then pressing <CLEAR>.

**START** Begins a program run. When the <START> key is pressed, the prompt

INIT V

for INITIAL vial appears on the display. This query asks for the vial number of the first sample. The prompt is answered by pressing the desired number(s) followed by pressing <ENTER>. The vial number need not be entered if the display shows the correct number. Simply press the <ENTER> key. The turntable will rotate to the desired first sample vial should it not already be positioned under the needle.

After the INITIAL Vial has been entered, the prompt

RINSE 0

will appear. This prompt allows selection of one of three RINSE modes. An entry of 0 allows all vials to run as individually programmed. An entry of 1 assigns all odd numbered vials to the RINSE function and an entry of 2 assigns all even numbered vials to the RINSE function.

Once the RINSE selection has been ENTERed, the prompt

LAST V

for LAST Vial will appear on the display. The number(s) corresponding to the vial containing the last sample to be analyzed is ENTERed. An entry of 99 to the LAST Vial prompt will allow continuous analysis of all 64 sample positions. The Autosampler will begin the programmed run after the response to LAST Vial is ENTERed.

**STOP** Terminates a programmed run and places the Autosampler in the DIALOGUE mode. The Autosampler will be placed in LOCAL control if <STOP> is pressed while the instrument is in REMOTE control. The needle is not retracted so that the option of re-summing the analysis of that sample is available.

An example of how the DIALOGUE mode is used should clarify the function of the keys. Start the DIALOGUE by pressing the <STOP> key to remove all previous instructions. The display will show

VIAL NN,

where NN is the number of the vial currently positioned under the needle. The number of the desired first vial in the range 1 to 64 is now entered by pressing the desired number(s), for example, 1

VIAL 1 <ENTER>.

The prompt

THRU NN,

will appear on the display. NN is the number of the previous entry. The number for the last vial in the range 1 to 64 is now entered by pressing the desired number(s), for example, 15

THRU 15 <ENTER>.

Certain situations require that vials be programmed one at a time. For example, if VIAL 1 is a sample and VIAL 2 is a RINSE. The proper response will be

VIAL 1 <ENTER>  
THRU 2 <ENTER>.

After the THRU prompt is answered, the next prompt

INJ N,

where N is the previous entry, appears on the display. The number of injections from 1 to 3 per vial or sequence of vials is now ENTERed. For example, if three injections per vial are desired, press 3

INJ 3 <ENTER>.

Two additional codes are available. An entry of 0 to the INJ prompt will allow that vial or vials to be skipped. An entry of 9 to the INJ prompt will cause that vial or vials to be a RINSE.

The final prompt is

TIME NN.N oder  
TIME NNN,

where NN.N or NNN is the desired time between injections. Two time ranges are available, 0.1 to 99.9 minutes and 100 to 999 minutes. For example, 15 would be entered

TIME 15.0 <ENTER>.

for a fifteen minute analysis. The number 150 would be entered

TIME 150 <ENTER>.

for a one hundred and fifty minute analysis.

The prompt, AUX, may be added to the DIALOGUE by using the <AUX> key (see Section 4.3.2). The AUXiliary timer actuates a contact closure between the two auxiliary outputs on the terminal strip connector (11). It is used for controlling accessory devices (e.g. the Auto Zero function of the 690 Ion Chromatograph). The prompt

AUX NN.N or  
AUX NNN.

has two time ranges as does the TIME prompt. However, the AUXiliary time must not exceed the TIME between injections, otherwise the timer will never actuate the contact closure.

#### 4.3.2. Function mode

The FUNCTION mode allows manual operation of the 698 Autosampler and selection of various control options or modes of instrument operation. The FUNCTION mode is accessed by first pressing the white function key, then pressing the number key with the desired function labeled in white above it. Table 1 summarizes the function of each of these keys.

Function keys operate in two ways. <INDEX>, <LOAD LOOP>, <INJECT>, <RAISE NEEDLE> and <HELP> cause direct actions by the Autosampler. These keys are accessed by first pressing the white function key, then the desired action key. The remaining function keys: <SELECT LOOP>, <MULTI-LOOP>, <AUX>, <LOCAL/REMOTE>, <EXT INJECT> and <SPECIAL> allow selection of an option or mode of operation. These keys are accessed by first pressing the white function key, then pressing the desired action key and holding it in. The selections offered by that key will cycle on the display. When the desired selection appears on the display, the key is released to enable that option. To cancel the FUNCTION mode after the white function key has been pressed, again press the white function key.

- |                     |   |
|---------------------|---|
| <b>INDEX</b>        | Advances the turntable (7) to the next vial position. The needle (4) will be raised to the (upper) home position before the turntable advances should it be down.   |
| <b>LOAD LOOP</b>    | Drives the needle (4) downward to the next injection position (see Fig. 6). The injection valve of the 690 Ion Chromatograph will be rotated to the LOAD (Fill) position. The needle will not descend should the turntable be misaligned. The <LOAD LOOP> command will be ignored should the needle be at the lowest INJECT position. |
| <b>INJECT</b>       | Rotates the injection valve of the 690 Ion Chromatograph to the INJECT position. The <LOAD LOOP> command must be issued first.  |
| <b>RAISE NEEDLE</b> | Retracts the needle (4) to its home position.   |

**Table 1: Description of keys**

Key	Description
INDEX*	Rotates turntable counterclockwise to the next vial position.
LOAD LOOP*	Rotates injector valve to the LOAD (Fill) position and drives needle downward for up to three injections per vial.
INJECT*	Rotates valve to the INJECT position.
RAISE NEEDLE*	Retracts needle to the HOME (upper) position.
SELECT LOOP**	Allows selection of one of three loops with multiloop injection valves.
MULTI-LOOP**	Places Autosampler in multi-loop operation. MULT ON enables, MULT OFF disables.
AUX**	Adds AUXiliary time prompt for contact closure of the auxiliary outputs to the DIALOGUE: AUX ON enables, AUX OFF disables.
LOCAL/REMOTE**	Places Autosampler in REMOTE operation (control via RS 232C interface): REMOTE enables, LOCAL disables.
HELP*	Provides HELP MESSAGE for programming and troubleshooting assistance.
EXT INJECT**	Places Autosampler in remote injection control by external contact closure: EXTERNAL enables, INTERNAL disables.
White Colored	Places keypad in the FUNCTION mode.
START	Starts a programmed run. Asks for INITIAL Vial, RINSE and LAST Vial.
CLEAR	Clears a numerical entry before it is ENTERed.
ENTER	Places numerical entry into program memory.

\* Requires white key to be first pressed.

\*\* Requires white key to be pressed first and action key to be held in to make selection

**MULTI-LOOP**

Allows selection of either normal single loop valve operation or multi-loop valve operation. The selections which will cycle on the display as the <MULTI-LOOP> key is held are, MULT OFF, which enables single loop operation, and MULT ON which enables multi-loop operation. The prompt, LOOP, is added to the DIALOGUE when MULT ON is enabled.

*Note:* For multi-loop operation the normal injection valve of the 690 Ion Chromatograph has to be replaced by an multi-loop injection valve.

**SELECT LOOP**

Allows selection of one of three loops with a multiloop valve. The <MULTI LOOP> key must first be pressed and the Autosampler set for MULT ON in order to use <SELECT LOOP>. The display will read INACTIVE should the Autosampler be in the MULT OFF mode. Loops are labeled 1 through 3. The <SELECT LOOP> key is released as the loop choice is displayed.

**Table 2: List of HELP MESSAGES**  
(displayed after pressing the white function key, then the HELP key)

Prompt	Message	Mode
VIAL NN	ENTER FIRST VIAL OF A RANGE OF VIALS, 1 - 64	DIALOGUE
THRU NN	ENTER LAST VIAL OF A RANGE OF VIALS, 1 - 64	DIALOGUE
INJ N	ENTER NUMBER OF INJECTIONS PER VIAL FOR THIS RANGE, 1 - 3 INJECTIONS, 0 FOR SKIP, 9 FOR RINSE	DIALOGUE
TIME NN.N	ENTER TIME DELAY UNTIL NEXT INJECTION, 00.1 - 99.9 or 100 - 999	DIALOGUE
AUX NNN	ENTER TIME DELAY UNTIL EXTERNAL RESET SIGNAL, 00.1 - 99.9 or 100 - 999	DIALOGUE
LOOP	ENTER NUMBER OF LOOP TO BE USED FOR THIS RANGE, 1 - 3	DIALOGUE
INIT V	ENTER INITIAL VIAL FOR AUTOMATIC RUN, 1-64	START
RINSE 0	ENTER 0 FOR NORMAL RUN, 1 FOR ODD RINSES, 2 FOR EVEN RINSES	START
LAST V	ENTER LAST VIAL FOR AUTOMATIC RUN, 1- 64 OR 99 FOR CONTINUOUS OPERATION	START

**AUX** Provides an additional prompt to the DIALOGUE (see Section 4.3.1). The selections AUX ON, which enables the AUXiliary timer, and AUX OFF, which disables the timer, will cycle on the display.

**LOCAL/REMOTE** Allows selection of either LOCAL front panel control or REMOTE control by a computer via the RS232 interface. The selections cycled on the display are LOCAL and REMOTE. The default condition is LOCAL.

**HELP** Provides assistance during data entry in the DIALOGUE mode. The <HELP> key is pressed when the DIALOGUE prompt for which assistance is required appears on the display. The appropriate message will scroll across the display. Three HELP messages are also provided for the <START> key. Table 2 lists the HELP messages and the prompt at which they appear.

**EXT INJECT** Enables or disables injection control by an external contact closure. The selections that cycle on the display are INTERNAL, which disables EXTERNAL INJECT, and EXTERNAL, which enables EXTERNAL INJECT. The TIME prompt is deleted from the DIALOGUE when EXTERNAL is enabled. Injection time is then controlled by an external source such as a computing integrator.

**SPECIAL** Allows selection of the way TIME is displayed during a programmed run. The selection cycled on the display are TIME UP, which allows increasing time to be displayed and TIME DOWN, which allows decreasing time to be displayed.

## 5. Operation

---

**Note:** The following notation convention is used in this manual:

- Words written in capitals, e.g. VIAL, indicate what is shown on the 698 Autosampler display.
- Underlined numbers, e.g. 1, indicate the numerical value entered into a program by pressing number keys.
- Words written in capitals and surrounded by brackets, e.g. <ENTER>, indicate which key to press.
- The keys are labeled on the keyface or in white letters above the key for special functions.

### 5.1. Loading sample vials

It is important that samples be free of particulate matter which may plug the needle or tubing. Metallic or gritty particles will cause damage to the valve. Therefore all samples must be filtered through a 0.45 µm membrane filter.

Load the vial to within about 6 mm of the top and push a plastic cap (with its opening down) into the vial. The cap has two sealing rings on its periphery. It should be pushed into a vial so that both rings engage and remain so. Otherwise, it may interfere with turntable rotation. The minimum sample size is 300 µL.

Air trapped under the plastic caps is of no consequence. The first stroke of the needle into the vial displaces enough liquid to force the air completely through the injector valve loop and through the waste outlet tube. Should any air remain in the vial, it will be above the needle opening and will not enter the tubing. The first stroke also forces enough sample through the tubing and loop to remove remnants of the previous sample.

### 5.2. Control settings

All control settings must be selected before running samples. Retention time is probably the single most important factor. The time setting should be sufficiently long for each injection to elute before the next injection is started. It may be necessary to allow time for baseline analysis and calculations when using a computing integrator.

#### 5.2.1. Power

The POWER switch must be set in the "1", or ON, position to supply power to the Autosampler and to actuate the ACCESSORY POWER CONTROL connector (12). Additional information is given in Section 3.3.

#### 5.2.2. Programming dialogue

The <STOP> key is pressed to initiate the programming DIALOGUE. The display will read

VIAL NN

**Step 1** Enter the number of the first sample vial and press the <ENTER> key.

VIAL 1 <ENTER>

The display will read

THRU NN

**Step 2** Enter the number of the last sample vial to be analyzed, or the same number as the previous vial if it is desired to program vials individually.

THRU 60 <ENTER> or  
THRU 1 <ENTER>

The display will read

INJ N

**Step 3** Enter the number of injections, from 1 to 3, per vial. An entry of 0 will allow the defined vials (VIAL NN THRU NN) to be skipped. An entry of 9 will make these vials a RINSE. Press <ENTER> after the desired number or code has been keyed:

INJ 2 <ENTER>

The display will read

TIME NNN

**Step 4** Enter the analysis time with any value from 0.1 to 999 min.

TIME 20 <ENTER>

**Step 5** (optional) The display may read

AUX NNN

should the AUXiliary timer option have been chosen (refer to *Section 4.3.2*). The AUXiliary time is also a number between 0.1 and 999 min and must be less than or equal to the value selected for TIME.

### 5.2.3. Running a program

Programs are initiated by pressing the <START> key. The display will read

INIT V

**Step 1** Enter the vial number for the first sample.

INIT V 1 <ENTER>

The turntable will rotate until the first sample vial is under the needle. The next display will read

RINSE 0

**Step 2** Enter choice of RINSE selection. An entry of 0 will allow individually programmed vials to run. Entries of 1 and 2 assigns every odd or even numbered vials to RINSE respectively.

RINSE 0 <ENTER>

The display will then read

LAST V

**Step 3** Enter the vial number for the last sample to be injected. An entry of 99 will allow continuous analysis.

LAST V 64 <ENTER>

#### 5.2.4. Stopping a run

A run can be terminated in two ways.

- STOP key** Pressing the <STOP> key terminates the program and places the keypad in the DIALOGUE mode. The Autosampler will be placed in LOCAL operation should it be in REMOTE operation at the time <STOP> was pressed. The needle will not retract.
- POWER off** The second method of terminating a run is by turning off power. This method should be reserved for emergencies.

#### 5.3. Manual operation

The sample loading and injection processes of the 698 Autosampler may be operated manually. The turntable is first rotated until the desired sample vial is positioned under the needle. This is accomplished by either rotating the turntable manually or by pressing the white function key and the <INDEX> key until the sample is in the desired position. The white function key is then pressed followed by pressing <LOAD LOOP>. Pressing the white function key again followed by the <INJECT> key will inject the sample onto the column.

#### 5.4. Operation summary

Tables 3 and 4 abbreviate operating instructions for the 698 Autosampler. These tables are intended as a ready reference for an operator already familiar with the instrument. The descriptive sections in this manual should be fully understood before relying on these abbreviated guides to ensure proper operation.

**Table 3: Dialogue description**

Prompt	Description	Reply	Reference
VIAL NN	Current vial position under the needle.	ENTER number of initial sample vial. Range: 1 ... 64	Sections 4.3.1 and 5.2.2
THRU NN	Last vial in a sequence or last RINSE vial.	ENTER number of final sample vial in a sequence. In the case of a RINSE, ENTER previous first vial number. Range: 1 ... 64	Sections 4.3.1 and 5.2.2
INJ N	The number of injections per vial.	ENTER number of injections. ENTER 0 to skip a vial. ENTER 9 to make vial a RINSE. Range: 1 ... 3, 0, 9	Sections 4.3.1 and 5.2.2
TIME NNN	Time between injections.	ENTER the time between injections. Range: 0.1 ... 999 min	Sections 4.3.1 and 5.2.2
AUX NNN	Auxiliary times for programmable contact closure.	ENTER the time at which contact closure is made. Range: 0.1 ... 999 min	Sections 4.3.1, 4.3.2 and 5.2.2

**Table 4: Start key dialogue**

Prompt	Description	Reply	Reference
INIT V	Initial vial number for analysis	ENTER vial number.	Sections 4.3.1 and 5.2.3
RINSE 0	Allows choice of normal run, odd or even vial rinses.	ENTER 0 for normal run. ENTER 1 for odd rinses. ENTER 2 for even rinses.	Sections 4.3.1 and 5.2.3
LAST V	Final vial number.	ENTER vial number.	Sections 4.3.1 and 5.2.3

## 6. Maintenance, malfunctions

### 6.1. Routine maintenance

#### 6.1.1. Sample preparation

Experience has demonstrated that most maintenance problems are caused by particles in the sample. Particles in the sample can plug the needle, transfer line and loop, and can permanently damage the sealing surfaces of the injector valve. Filtering the sample through a filter element with a maximum of 0.45 µm opening before loading the vial is highly recommended.

Precipitated buffer salts are another source of particulate material in the IC system. Flush the instrument with pure water by using the RINSE mode to inject at least two vials filled with water if previous samples were buffered. This procedure prevents damage to the valve by salt corrosion or crystallization.

#### 6.1.2. Self-Test

The Autosampler conducts an internal SELFTEST each time power is applied. Errors in the software that might occur will be indicated on the DISPLAY.

### 6.2. Needle replacement

Fig. 8 illustrates the removal of the needle. Retract the needle by first pressing <STOP>, then the white function key and then <RAISE NEEDLE>. Turn the unit off. Remove the needle guide using the 6.2621.020 open end wrench  $7/32''$  supplied in the accessory kit. The old needle can then be removed from the needle guide. Insert the new needle in the guide and place the two ferrules supplied with the 6.2620.070 needle on the  $1/16''$  OD tubing end (see Fig. 8). Replace the needle guide assembly and tighten the needle guide until finger-tight. Carefully push the needle up into the needle guide as far as possible. Tighten the needle guide  $1/2$  turn with the  $7/32''$  open-end wrench to set the ferrules. It is important that the upper end of the needle be butted against its seat as tightly as possible. Failure to do so will cause non-reproducible injection volumes.

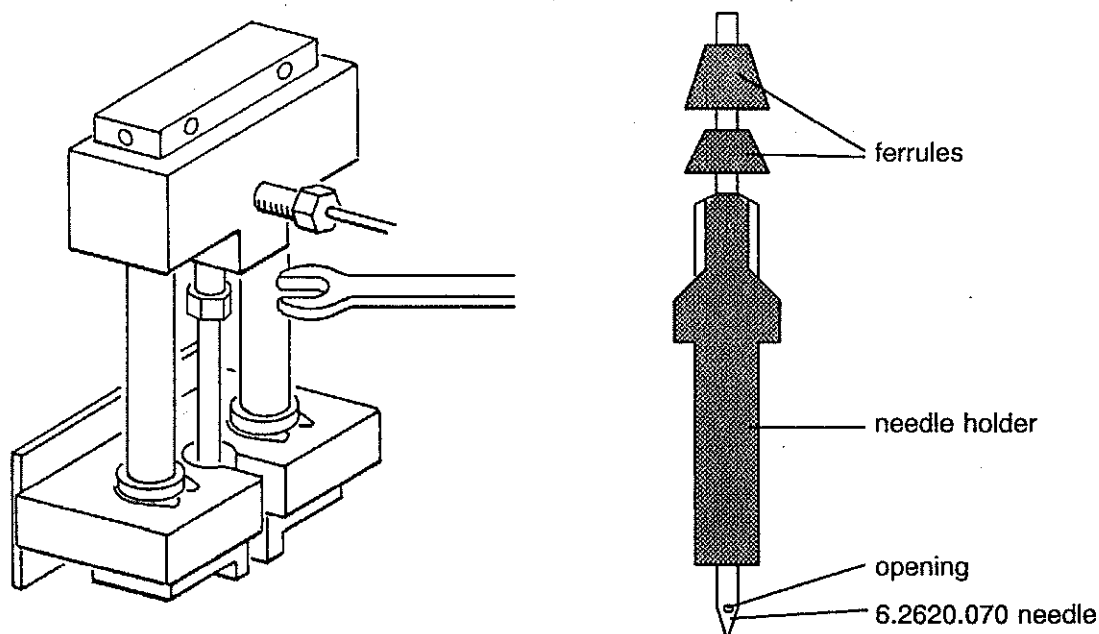


Fig. 8: Needle removal procedure

## 6.3. In case of difficulty

### 6.3.1. Non-reproducible injections

Non-reproducible injections are usually due to one of three problems: leakage, plugged tubing, or poorly swaged fittings. In some instances, non-reproducibility may appear to be injector related when, in fact, it is caused by other components in the chromatographic system. Systematically analyze the entire system to assure that efforts are expended on the proper component before undertaking any repair.

#### Leakage

Leakage is the simplest to detect of the three main causes of non-reproducibility. Leakage affects reproducibility by diverting solvent from the column in an unknown amount and requiring a longer time to elute the sample because of reduced solvent flow. Places to check for leakage are the transfer line between the needle and the valve, the needle, injector loop, and injector seals. Once the leak has been found, either tighten the fitting or replace the fitting should tightening not be sufficient.

#### Plugged tubing

Plugs and partial plugs due to debris may occur in the needle, the transfer line, the injector loop, or the injector body. Plugs prevent proper loading of the sample loop.

Disconnect both ends of the transfer line tubing (8) and use a syringe to force solvent through to check for blockage. There should be no difficulty in forcing solvent freely through the 0.3 mm ID tubing. Force solvent through the needle in the same fashion. There should be no difficulty in forcing solvent freely through the needle. Replace the needle or the tubing if either is plugged and resume operation.

Remove the sample loop from the injector valve body of the 690 Ion Chromatograph and check it for blockage with a syringe if the problem persists. Partial blockage of the loop will prevent accurate and consistent sample loading, therefore the loop must be replaced.

#### Poorly swaged fittings

Non-reproducibility due to dead volume caused by poorly swaged fittings usually occurs after incorrect installation of new loops or other connections or after changing previously swaged loops. A gap as small as 0.05 mm (0.002") between the end of the tubing and the shoulder inside the female portion of the fitting will have a dead volume of 0.1  $\mu$ L with 1/16" OD tubing. Carefully follow the procedure in *Section 3.2* for correct assembly of fittings.

When using a previously swaged tube, be sure to use it with the fitting in which its ferrules were originally set. Small inconsistencies in the machining of the fitting are a source of dead volume.

### 6.3.2. Leaking injector valve

The probable cause of injector valve leakage is a worn or damaged seal. Follow the procedure in *Section 3.2* for the assembly of new fittings.

### 6.3.3. Missed injections

The injection valve of the 690 Ion Chromatograph should be checked if sample is not being injected or occasional injections are missed. Perform several injections while watching the injection valve. Should the valve rotate and sample is not placed on the column, refer to *Section 6.3.1* and check for a plug or leak.

If the valve does not rotate, proceed as follows: Check to make sure that the mains switch on the 690 Ion Chromatograph is in the ON position and lights up. Inspect the connections at both ends of the 6.2128.030 connecting cable between the 698 Autosampler and the 690 Ion Chromatograph and make sure that both ends are securely fastened with good electrical contact. Perform additional injections while watching the valve. If the valve does not rotate, disconnect the 6.2128.030 connecting cable from the 690 Ion Chromatograph and test the valve manually using the manual switch (34-690) of the 690 Ion Chromatograph. Contact the nearest METROHM service representative should the valve rotate using the manual switch but fail to rotate under Autosampler control or fail to rotate under either condition.

## 6.4. Error messages

The Model 698 Autosampler is programmed to detect errors in both the instrument firmware and hardware. Instrument operation is halted and the appropriate error code will be displayed when an error is detected. Pressing any key other than <STOP> on the keypad after the error code is shown will allow the appropriate error message to scroll across the display. After the error message is displayed, shut off power to the unit. Pressing the <STOP> key will clear the error code and restart the Autosampler.

A beeping sound will accompany the display of the error code. The duration of the beeping sound can be user-selected and the instrument is shipped in the short duration configuration. Consult *Section 7.4* for beeping sound duration selection. The error codes and messages are discussed below.

**ERROR 1      ROM CHECKSUM INCORRECT**  
ERROR 1 occurs if an improper checksum value is determined during the SELFTEST conducted at power-up (*Section 3.4*). Contact the nearest METROHM service representative if ERROR 1 appears.

**ERROR 2      RAM FAILED READ/WRITE TEST**  
ERROR 2 occurs if the RAM read/write test fails during the SELFTEST conducted at power up (*Section 3.4*). Contact the nearest METROHM service representative if ERROR 2 appears.

**ERROR 3      CANNOT FIND PROPER TURNTABLE POSITION**  
ERROR 3 occurs if the turntable is misaligned or has a component failure. Contact the nearest METROHM service representative if an ERROR 3 appears.

**ERROR 4      CANNOT FIND PROPER NEEDLE POSITION**  
ERROR 4 occurs if the time required for the needle to descend to the next injection position is longer than 60 s for two consecutive vials. Should a time limit violation occur for the first time, the alarm will sound, the needle will retract and the turntable will index to the next vial position. A second time limit violation will halt the instrument.

The usual cause for an ERROR 4 is a plugged needle, transfer line, sample loop, or waste line. Refer to *Section 6.3.1* for the procedures for detecting and eliminating plugs in the system should an ERROR 4 occur.

Inspect the needle drive assembly for any obstacle which may hinder needle movement if no plug is found. Contact the nearest METROHM service representative if an ERROR 4 occurs and no tubing blockage or needle obstacle is found.

## 7. Technical data

---

### 7.1. Technical data of the 698 Autosampler

#### Sampling

<i>Method</i>	Positive displacement
<i>Capacity</i>	64 sample vials of 700 $\mu$ L each
<i>Repetitions</i>	Maximum three sample injections from each vial (depending on sample loop volume)

#### Display

<i>Type</i>	Eight-digit LED
<i>Displayed parameters</i>	Vial number, injection number, rinse, time to next injection, auxiliary time, error code, HELP messages

#### Control

<i>Front Panel</i>	Power switch, 16-key keypad
<i>Remote</i>	Injection control by programmable contact closure. RS 232C with 8-bit data, no parity. Baud rate autoselectable from 300, 600, 1200, 2400 4800, 9600, 19200 bits/s.

#### Interface

<i>Signal-to remote</i>	RS 232C
<i>Contact Closure</i>	User-selectable normally open or normally closed, programmable auxiliary output and injection signal

#### Materials

<i>Sample vials</i>	Polypropylene or borosilicate glass (option) with polyethylene caps (plasticizer-free)
<i>Tubing</i>	PTFE microcapillary tubing
<i>Hausing</i>	Aluminium, stainless steel, Mylar®, Polane paint, and polypropylene

#### Ambient temperature

<i>Nominal operating range</i>	+ 15 ... + 30 °C
<i>Storage, transport</i>	- 40 ... + 70 °C

#### Mains connection

<i>Mains voltage</i>	$U_n = 100, 120, 220, 240 \text{ V} \pm 10 \%$ , switchable
<i>Mains frequency</i>	$f = 50 \dots 60 \text{ Hz}$
<i>Power consumption</i>	ca. 55 VA
<i>Fuse</i>	6 mm $\varnothing$ , length 32 mm 100 and 120 V: 0.5 A (slow-blow) order no. U.600.0504 220 and 240 V: 0.25 A (slow-blow) order no. U.600.0503

#### Dimensions

<i>Width</i>	248 mm (9.8 in)
<i>Height</i>	384 mm (15.1 in)
<i>Depth</i>	419 mm (16.5 in)

<b>Weight</b>	11 kg (24.3 lb)
---------------	-----------------

## 7.2. Accessory power control connector

The ACCESSORY POWER CONTROL connector (12) provides a +5 VDC (50 mA maximum) signal for actuating a solid state relay to switch on AC power for an external accessory such as an HPLC pump or strip chart recorder. This outlet is primarily controlled by the POWER switch (1). It is actuated when the POWER switch is turned ON. It will be turned OFF when the POWER switch (1) is turned OFF. The ACCESSORY POWER CONTROL outlet will also turn off when the Autosampler completes the last analysis for the vial designated LAST VIAL. The <START> key is pressed to reactivate ACCESSORY POWER CONTROL after completion of the LAST VIAL.

Fig. 9 shows the pin assignments for the ACCESSORY POWER CONTROL connector (12):

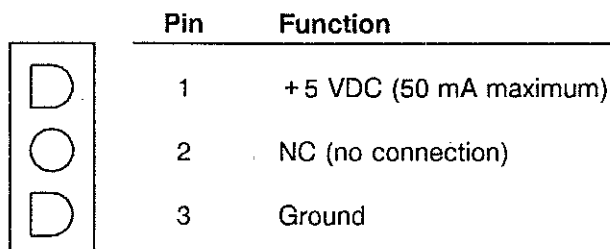


Fig. 9: Pin assignments for the accessory power control connector

## 7.3. Valve connector

The VALVE connector (13) is used to interface the 698 Autosampler to the electrically operated injection valve of the 690.0020 or 690.0030 Ion Chromatograph by means of the 6.2128.030 connecting cable. Fig. 10 illustrates the VALVE connector and its pin assignments. The interface between the 698 Autosampler and the Valco two-position actuator of the 690.0020 or 690.0030 Ion Chromatograph is shown schematically in Fig. 11.

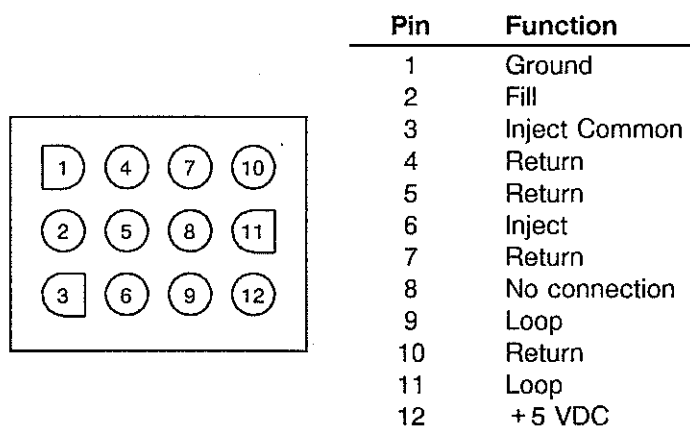


Fig. 10: Pin assignments for the valve connector

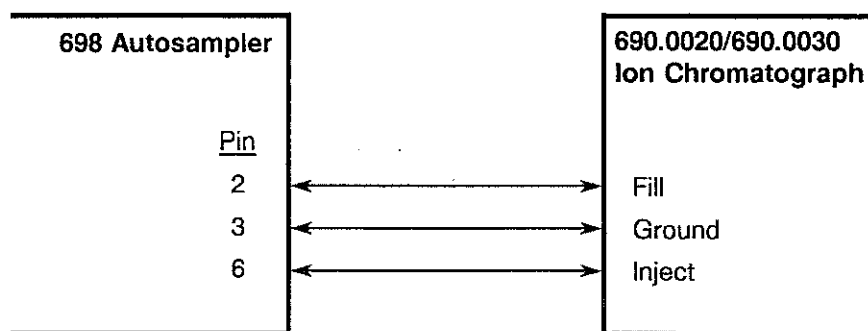








Fig. 11: Injector valve interface

## 7.4. Terminal strip connector

The six-pin terminal strip connector (11) provides for partial external control of the 698 Autosampler and control of external devices by the 698 Autosampler. Fig. 12 shows the pin assignments for the TERMINAL STRIP connector.

	Pin	Function
	1	Inject Signal Output
	2	Inject Signal Output
	3	Auxiliary Output
	4	Auxiliary Output
	5	Input External Start
	6	Ground

**Fig. 12:** Pin assignments for the terminal strip connector

### Inject Signal

The INJECT SIGNAL is a contact closure between pins 1 and 2 of the terminal strip (11). The closure is made when the Autosampler signals the injection valve to rotate to the INJECT position. The INJECT SIGNAL is normally used to start a computing integrator. Duration of contact approx. 1.2 s.

### Auxiliary Output

The AUXILIARY OUTPUT is a contact closure between pins 3 and 4 of the terminal strip (11). The time until closure is programmed using the AUXiliary timer key. The contacts remain closed for about 0.5 seconds and then reopen. Section 4.3.2, FUNCTION MODE, describes the procedure for enabling the AUXiliary timer. The AUXILIARY OUTPUT is used for starting the Auto Zero function of the 690 Ion Chromatograph and for controlling accessory devices.

### External Inject

The EXTERNAL INJECT connector is provided through pins 5 and 6 of the terminal strip (11). An external contact closure made between these pins will cause the Autosampler to begin a program should the sampler be in the EXTERNAL mode (Section 4.3.2). It is used for partial external control of the Autosampler. The Autosampler recognizes the moment that contact closure occurs (edge detection). The contacts may be opened at any convenient time after closure.

### Conversion procedures

The 698 Autosampler is shipped from the factory with the INJECT SIGNAL and the AUXILIARY OUTPUT contact closures in the normally open configuration and will close when actuated. Both switches may be changed to the normally closed configuration to open when actuated. The configuration is changed by moving jumper JP1 for AUXILIARY OUTPUT and jumper JP2 for INJECT SIGNAL. These jumpers are located in the middle/lower half of I/O printed circuit board. Fig. 13 shows their location.

The Autosampler is also shipped from the factory with the error claim beeper set for a short duration. This means that should any ERROR occur, the alarm beeper will sound for approximately ten seconds (five beeps) and shut off, leaving the ERROR message on the display. The alarm beeper can be set to sound indefinitely (until the <STOP> key is pressed) by closing all four switches on the dip switch located in the lower left-hand corner of Fig. 13.

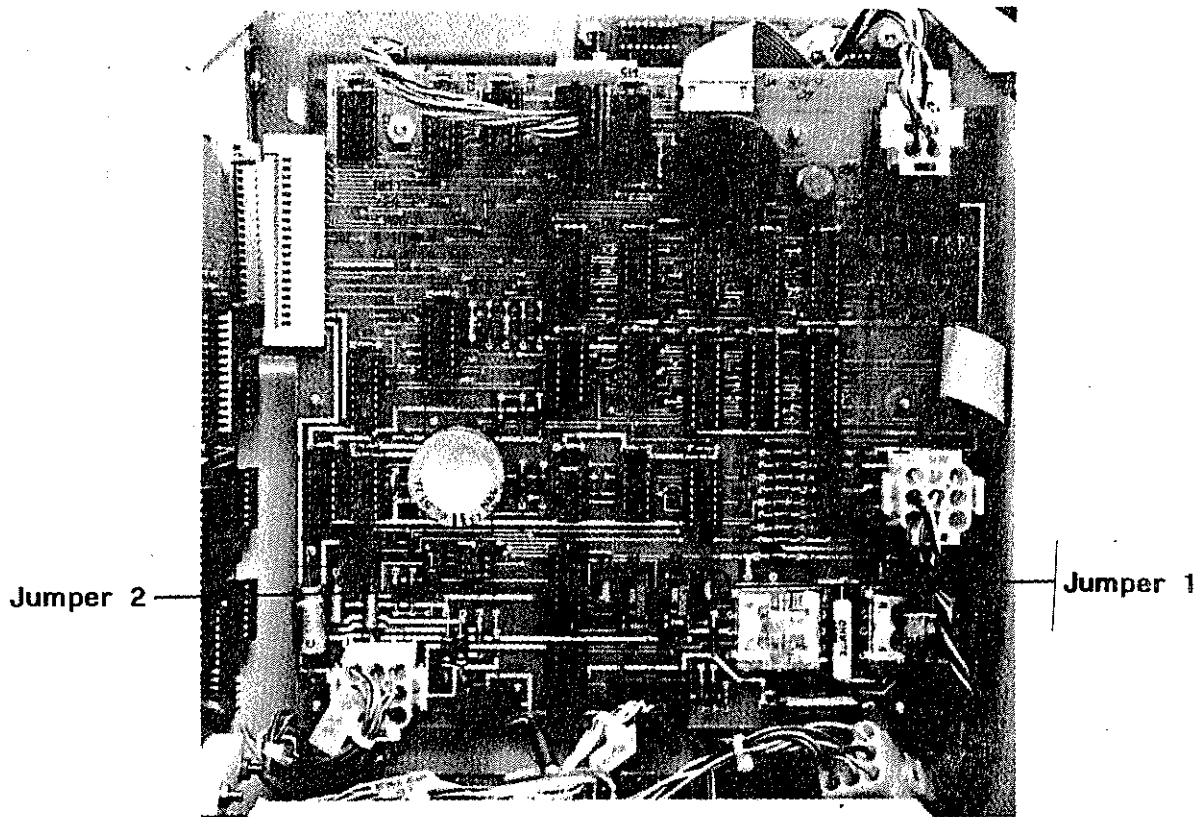


Fig. 13: Jumper location

## 7.5. RS 232C interface

### 7.5.1. General information

The RS 232C interface (10) built into the 698 Autosampler as standard is used for complete control of the 698 Autosampler by an external computer or data collection system. The interface is wired as a DCE device (DCE: Data Communication Equipment) and has the following technical data:

**Data interface in accordance with EIA standard RS 232C (DIN 66020, sheet 1)**

Baud rates:	300, 600, 1200, 2400, 4800, 9600, 19200 bits/s (automatically selected by the Autosampler)
Parity:	none
Start bit:	1
Stop bits:	2
Word length:	8-bit
Cable length:	max. ca. 20 m

Attachment is made by a 25-pin D-type female connector. Pin assignments are listed in Fig. 14. Pin 2 is serial data in, pin 3 is serial data out, and pin 7 is ground. The remaining pins are not connected. A cable for the connection of an IBM PC AT or compatible computer is available from METROHM (order no.: 6.2125.010).

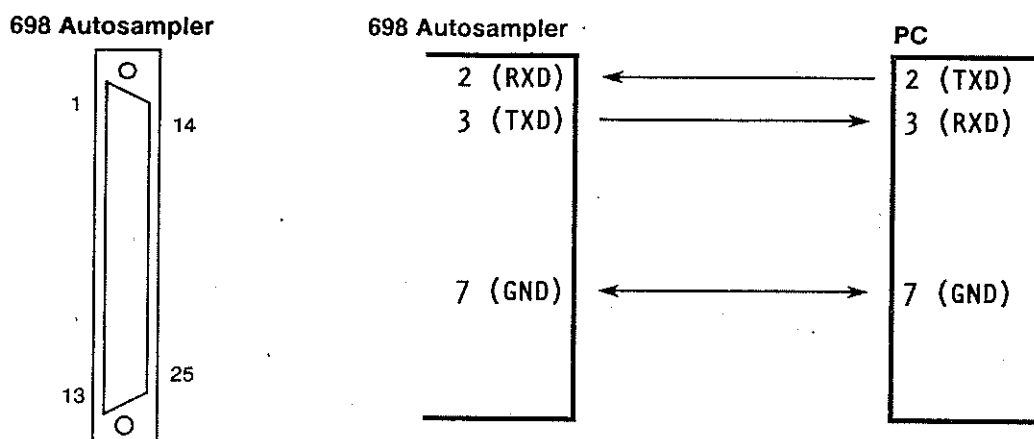


Fig. 14: Pin assignments for the RS 232C connector

### 7.5.2. Command codes and program example

The ASCII (American Standard Code for Information Interchange) code equivalents for the keys of the keypad are given in Table 5. The codes are used for sending commands from an external computer to the 698 Autosampler for remote control.

An example program written in GWBASIC for control of the 698 Autosampler by an IBM Personal Computer is given below. It can be easily modified for use with other computers. The listing contains many remark statements to explain how the program operates and to facilitate translation to other computers or languages.

Key	ASCII Code	Hexadecimal	Decimal
White (Function)	F	\$46	70
START	E	\$45	69
STOP	S	\$53	83
CLEAR	C	\$43	67
ENTER	CR (Carriage Return)	\$0D	13
. (LOCAL/REMOTE)	.	\$2E	46
0 (RAISE NEEDLE)	0	\$30	48
1 (INJECT)	1	\$31	49
2 (AUX)	2	\$32	50
3 (SPECIAL)	3	\$33	51
4 (LOAD LOOP)	4	\$34	52
5 (MULTI-LOOP)	5	\$35	53
6 (EXT INJECT)	6	\$36	54
7 (INDEX)	7	\$37	55
8 (SELECT LOOP)	8	\$38	56
9 (HELP)	9	\$39	57

Table 5: ASCII equivalents of front panel keys

```
1010 'Demo Program to Control the Metrohm 698 Autosampler by an
1020 'IBM PC or Compatible Computer via RS232 Link
1030 'Version 0.010
1040 'Metrohm AG, CH-9101 Herisau, Switzerland
1050 '
1060 '
1070 TRUE%=(1=1) 'boolean true
1080 FALSE%=NOT TRUE% 'boolean false
1090 SHORT%=2 '2 s delay
1100 LONG%=9 '9 s delay
1110 '
1120 'establish communication
1130 CLS:PRINT "attempting to establish communication..."
1140 OPEN"COM1: 9600,N,8,1,RS,CS,DS,CD"AS#1
1150 DONE%=FALSE%
1160 WHILE NOT DONE%
1170 OUT &H3FD,0 'clear status register
1180 FOR I=1 TO 20
1190 PRINT#1, "A"; ' "A" is recommended autobaud
1195 'detect character
1200 FOR J=1 TO 50
1210 IF LOC (1)<>0 THEN DONE%=TRUE% 'exit when 698 sends
1215 'back a char.
1220 NEXT J
1230 NEXT I
1240 IF NOT DONE% THEN PRINT "698 not responding"
1250 WEND
1260 PRINT "contact established"
1270 '
1280 GOSUB 1600 'get response "REMOTE"
1290 GOSUB 1600 'get response "VIAL XX"
1300 '
1310 ' insert your own routines here!
1320 ' *****
1330 '
1340 'for example
1350 DELAY%=SHORT%:GOSUB 1660
1360 PRINT #1,"1" 'Vial # 1
1370 DELAY%=SHORT%:GOSUB 1660
1380 PRINT#1,"3" 'Thru # 3
1390 DELAY%=SHORT%:GOSUB 1660
1400 PRINT#1,"1" 'Inj 1
1410 DELAY%=SHORT%:GOSUB 1660
1420 PRINT#1,"2" 'Time 2
1430 DELAY%=SHORT%:GOSUB 1660
1440 PRINT#1,"0.5" 'Aux 0.5
1450 DELAY%=SHORT%:GOSUB 1660
1460 PRINT#1,"E"; '"START", suppress CR/LF by ";"
1470 DELAY%=SHORT%:GOSUB 1660
1480 PRINT#1,"1" 'Init V # 1
1490 DELAY%=LONG%:GOSUB 1660 'give turntable time to go to
1495 'starting pos.
1500 PRINT#1,"0" 'Rinse 0
1510 DELAY%=SHORT%:GOSUB 1660
1520 PRINT#1,"3" 'Last V # 3
1530 'end example
1540 '
1550 CLOSE
1560 PRINT:PRINT "program terminated"
1570 END
```

```
1580 '
1590 '===== read from 698 =====
1600 REM
1610 LINE INPUT#1,A$           'get response
1620 PRINT A$;                 'display it
1630 RETURN
1640 '
1650 '===== delay =====
1660 REM
1670 ON TIMER(DELAY%) GOSUB 1740
1680 TIMER ON                   'enable timer interrupt
1690 IF DELAY%>2 THEN PRINT:PRINT "waiting";DELAY%;"seconds"
1700 WAITING%=TRUE%
1710 WHILE WAITING%: WEND      'wait until interrupted
1720 RETURN
1730 '
1740 TIMER OFF
1750 WAITING%=FALSE%
1760 RETURN
```

## Remarks

- For running this program example proceed as follows:

- Switch off the 698 Autosampler and wait a few seconds
- Clear the program memory of the 698 Autosampler by pressing the white function key and the key <CLEAR>
- Select the REMOTE control mode (see *Section 4.3.2*)
- Start the program on the Personal Computer (for some computers the time variables SHORT% and LONG% have to be changed)
- If the prompt reads "698 not responding", the program can be stopped by pressing "CTRL-Break" on the PC or by switching off the 698 Autosampler

## 8. Scope of delivery and ordering designations

---

### 8.1. 698 Autosampler

<b>698 Autosampler</b>	<b>2.698.0010</b>
<i>including the following accessories:</i>	
1 × PTFE Microcapillary tubing, int.diam. = 0.3 mm, ext.diam. = 1.5 mm, length L = 1 m	6.1803.000
1 × Connecting Cable 698 Autosampler (Auxiliary Output) – 690 Ion Chromatograph (Auto Zero) with 2 type B plugs and 2 cable brackets	6.2115.030
1 × Connecting Cable 698 Autosampler (Valve) – 690 Ion Chromatograph (Inject, Fill, Ground) length L = 1.5 m	6.2128.030
1 × Replacement needle (incl. 2 ferrules)	6.2620.070
1 × Open-end spanner $\frac{1}{4}'' \times \frac{5}{16}''$ for 6.2620.000 Compression fitting	6.2621.010
1 × Open-end spanner $\frac{7}{32}''$ for 6.2620.070 needle	6.2621.020
1 × Protective cover, polymethylmethacrylate, for sample tray	6.2742.000
1 × Polypropylene sample vial with polyethylene cap, set of 1000	6.2413.000
1 × PVDF compression fitting, set of 5	6.2744.000
1 × Hose clamp, self-adhesive, for fixing the 6.1803.000 PTFE microcapillary tubing	Y.107.0150
1 × Mains cable cable socket type CEE (22), V cable plug to customer's specifications: type SEV 12 (Switzerland ...)	6.2122.020
type CEE (7), VII (Federal Republic of Germany ...)	6.2122.040
type NEMA/ASA (USA ...)	6.2122.070
1 × Instructions for Use	8.698.1013

### 8.2. Options

Borosilicate glass sample vials, set of 1000	6.2413.000
Polyethylene caps for sample vials, set of 1000	6.2743.010

<i>Subject to modifications!</i>
----------------------------------

## 9. Warranty

---

The warranty regarding our products is limited to rectification free of charge in our workshops of defects that can be proved to be due to material, design or manufacturing faults which appear within 12 months from the day of delivery. Transport costs are chargeable to the orderer.

For day and night operation, the warranty is valid for 6 months.

Glass breakage in the case of electrodes or other glass parts is not covered by the warranty. Checks which are not a result of material or manufacturing faults are also charged during the warranty period. For parts of outside manufacture insofar as these constitute an appreciable part of our instrument, the warranty stipulations of the manufacturer in question apply.

With regard to the guarantee of accuracy, the technical specifications in the Instructions for Use are authoritative.

Concerning defects in material, construction or design as well as the absence of guaranteed features, the orderer has no rights or claims except those mentioned above.

If damage of the packaging is evident on receipt of a consignment or if the goods show signs of transport damage after unpacking, the carrier must be informed immediately and a written damage report demanded. Lack of an official damage report releases METROHM from any liability to pay compensation.

If any instruments and parts have to be returned, the original packaging should be used if at all possible. This applies above all to instruments, electrodes, burette cylinders and PTFE pistons. Before embedment in wood shavings or similar material, the parts must be packed in a dustproof package (for instruments, use of a plastic bag is imperative). If open assemblies are enclosed in the scope of delivery that are sensitive to electromagnetic voltages (e.g. data interfaces etc.) these must be returned in the associated original protective packaging (e.g. conductive protective bag). (Exception: assemblies with built-in voltage source belong in a non-conductive protective packaging). For damage which arises as a result of non-compliance with these instructions, no warranty responsibility whatsoever will be accepted by METROHM.

# 10. Index

## A

Accessory power control connector (12)	
Figure	2
Pin assignments	23
Technical data	23
Alarm beeper setting	24
Ambient temperature	22
Autosampler (698)	
Figure	1
Front	2
Packaging	4
Rear	2
Setting up	4
Technical data	22
Auto Zero function start	24
<AUX>	14
Auxiliary output	
Conversion	24
Figure	2
Technical data	24
Auxiliary time	
Description	14,24
Setting	12
AUX NN·N	9,12,14,16
AUX OFF	14
AUX ON	14

## B

Borosilicate glass sample vials	29
---------------------------------	----

## C

Caps for sample vials	29
<CLEAR>	10
Clearing of entries	10
Compression fitting	
Mounting	4
Ordering designation	29
Connection (9) for microcapillary tubing	
Connection of the transfer tubing	4
Figure	2
Connection of the 690 Ion Chromatograph	4ff
Connection scheme 698 - 690 - Integrator	5
Continuous analysis	11
Control elements	2
Control settings	15ff
Conversions	24

## D

Dead volume	20
Dialogue description	18
Dialogue mode	10ff
Dimensions	22
Display (2)	
Description	8f
Figure	2
Technical data	22

## E

Electrical connections	5
<ENTER>	10
Entering of values	10
Error messages	21
ERROR N	21
External Inject output	
Figure	2
Technical data	24
External program start	14,24
<EXT INJECT>	14

## F

Filtering of samples	15,19
Function keys	
Description	12ff
Summary	13
Function mode	12ff
Fuse	
Data on rear	2
Replacement	6
Technical data	22

## G

General description	8ff
---------------------	-----

## H

<HELP>	14
HELP messages	14
Hose clamp	4,29

## I

IC Pump 697	
Figure	1
In case of difficulty	20f
<INDEX>	12
Initial checkout	6f
INIT V	10,16
<INJECT>	12
Injection	
Number of injections	11
Theory of operation	8f
Injection valve (690 IC)	
Connection of transfer tubing	5
Connection with output (13)	23
Malfunctions	20f
Manual operation	12,17
Injector deliveries	9
Inject Signal output	
Conversion	24
Figure	2
Technical data	24
INJ N	11,16
INJ N/M	9
Installation	4ff
Instrument number	3

Integrator start	24
Introduction	1
Ion Chromatograph 690	
Connection of 698 Autosampler	4ff
Figure	1

## J

Jumper location	25
-----------------	----

## K

Keypad (3)	
Description	9ff
Dialogue mode	10ff
Figure	2,10
Function mode	12ff

## L

LAST V	11,16
Leakage	20
LED display	<i>see Display</i>
List of figures	II
List of tables	II
Loading of sample vials	15
<LOAD LOOP>	12
LOCAL	14
<LOCAL/REMOTE>	14
LOOP	13

## M

Mains cable	
Connection on Autosampler	6
Ordering designation	29
Mains connection (14)	
Figure	2
Procedure	6
Technical data	22
Mains frequency	
Data on rear	3
Technical data	22
Mains voltage	
Data on rear	3
Setting	6
Technical data	22
Maintenance	19
Malfunctions	20ff
Manual operation	17
Materials	22
Microcapillary tubing (8)	
Figure	2
Mounting of connectors	4f
Ordering designation	29
Tubing connection	4
Missed injections	20f
<MULTI-LOOP>	13
Multi loop operation	13
MULT OFF	13
MULT ON	13

**N**

Needle (4)  
 Figure ..... 2  
 Function mode ..... 8  
 Manual descending ..... 12  
 Manual retraction ..... 12  
 Ordering designation ..... 29  
 Replacement ..... 19

Needle replacement ..... 19

Non-reproducible injections ..... 20

**O**

ON/OFF switch (1)  
 Figure ..... 2  
 Operation ..... 15f  
 Operational readiness ..... 3,15  
 Operation summary ..... 17f  
 Ordering designations ..... 29

**P**

Plugging ..... 20  
 Polyethylene caps ..... 29  
 Polypropylene vials ..... 29  
 Poorly swaged fittings ..... 20  
 Power consumption data ..... 3,22  
 Power switch (1)  
 Figure ..... 2  
 Programming dialogue ..... 15f  
 PTFE microcapillary tubing  
 ..... see *Microcapillary tubing*

**Q**

Quadrant (6) for vials  
 Figure ..... 2  
 Insertion of vials ..... 8

**R**

< RAISE NEEDLE > ..... 12

Rating plate (16)  
 Figure ..... 2

REMOTE ..... 14

Remote control  
 ..... see *RS 232C*

Retention time ..... 15

RINSE □ ..... 10,16

Rinse mode ..... 10,16

Rinsing ..... 10,16,19

RS 232C interface (10)  
 Command codes ..... 25  
 Connection cable for IBM PC AT ..... 25  
 Figure ..... 2  
 General information ..... 25  
 Pin assignments ..... 26  
 Program example ..... 26f  
 Switching on/off ..... 14  
 Technical data ..... 25

Running a program ..... 10f,16f

**S**

Sample preparation ..... 19

Samples  
 Filtering ..... 15  
 Loading into vials ..... 15  
 Preparation ..... 19  
 Requirements ..... 15

Scope of delivery ..... 29

< SELECT LOOP > ..... 13

SELFTEST ..... 6,19

Serial number ..... 3

Setting up the instrument ..... 4

Single loop operation ..... 13

< SPECIAL > ..... 14

< START > ..... 10,16,18

< STOP > ..... 11,15,17

Stopping a run ..... 11,17

**T**

Table of contents ..... I

Technical data ..... 22

Terminal strip connector (11)  
 Figure ..... 2  
 Pin assignments ..... 24  
 Technical data ..... 24

Theory of operation ..... 8

THRU NN ..... 11,16

TIME DOWN ..... 14

TIME NN·N ..... 9,11,14,16

TIME UP ..... 14

Transfer tubing (8)  
 Figure ..... 2  
 Mounting of connectors ..... 4  
 Plugging ..... 20  
 Tubing connection ..... 4f

Transport damage ..... 6,30

Tubing connection ..... 4f

Turntable (7)  
 Figure ..... 2  
 Manual operation ..... 12,17  
 Placement of quadrants ..... 8

Type number ..... 3

**V**

Valve connector (13)  
 Connection with injection valve ..... 23  
 Figure ..... 2  
 Pin assignments ..... 23  
 Technical data ..... 23

Vial (5)  
 Dimensions ..... 9  
 Figure ..... 2  
 Filling ..... 15  
 General description ..... 8  
 Insertion in quadrant ..... 8  
 Insertion of plastic caps ..... 8,15  
 Minimal volume ..... 8,15  
 Ordering designations ..... 29

VIAL NN ..... 11,15

Vial number ..... 8

VNN -> VMM ..... 8

**W**

Warranty ..... 30

Weight ..... 22

White function key ..... 12

Window (15) for voltage selection  
 and fuse connection  
 Figure ..... 2  
 Opening ..... 6