MILESTONE

M I C R O W A V E
LABORATORY SYSTEMS

MultiQUANT® Package 5.4
for MLS 1200 PYRO

user manual

Thank you for having selected our system and welcome in the ever growing world club of Milestone users.

We are sure that you will be completely satisfied with this new tool entering your laboratory.

We invite you to read carefully this service manual and to keep it in reach for convenient and fast consulting.

For any possible clarification or any request of intervention, please contact either our Representative in your country:

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SUMMARY

1. PREFACE

This manual includes instructions for installation and start up of the MultiQUANT ® software package option for the MLS 1200 PYRO high temperature microwave muffle furnace.

It does not supersede the standard operator manual but is in addendum to it for the additional functions offered by this software.

2. INTRODUCTION

MultiQUANT® is a new Milestone technology which allows interfacing the MLS 1200 PYRO muffle furnace to external analytical balance and printer.

This software allows your microwave ashing system to attain higher speed and versatility thanks to the possibility of recording and printing up to 6 sample weights before and after the ashing process and therefore, to automatically determine the values for residue, volatile and statistics of the results.

3. MultiQUANT® PACKAGE

Besides the list of materials supplied with the MLS 1200 PYRO standard model, the MultiQUANT® package includes the following parts:
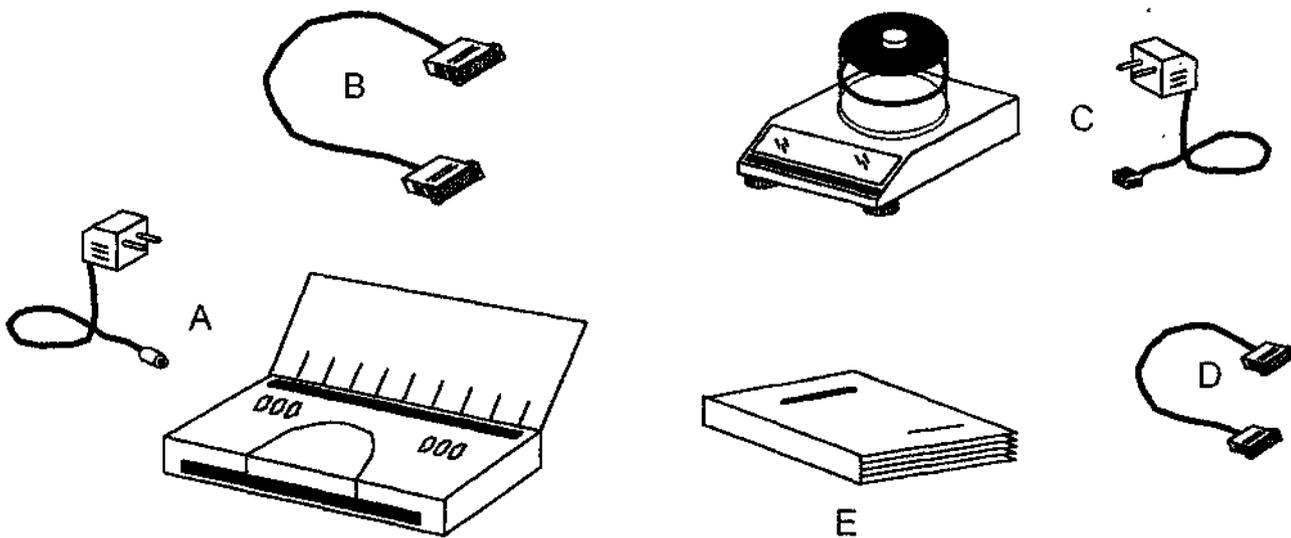

Figure 3.1: MultiQUANT package

A	P/N 34846	CANON BJ 30 printer with accessories.
B	P/N 50076	Connecting cable between MLS 1200 PYRO and printer (Centronix)
C	P/N 34845	METTLER BB 240 balance with accessories.
D	P/N 33921	Connecting cable between MLS 1200 PYRO and balance.
E	P/N	MultiQUANT® software manual.

For unpacking and start up of printer and balance, refer to their instructions included in the equipments.

The balance has to be set as follows for a correct dialogue with the MultiQUANT software.
- Switch on the balance by pressing the front bar.
- Reach the "I-FACE" menu.
- Set the parameters as described below:

S.	**Stb**
b	**1200**
P	**-S-**
PSE	**10**
Au	**off**

Consult the balance manual for the complete sequence of setting operations.

3.1   CONNECTION TO SARTORIUS BALANCE

It is available a special interface-box (P/N 40106) for those costumers who want to connect their SARTORIUS balance (AS series) to the MultiQUANT System.
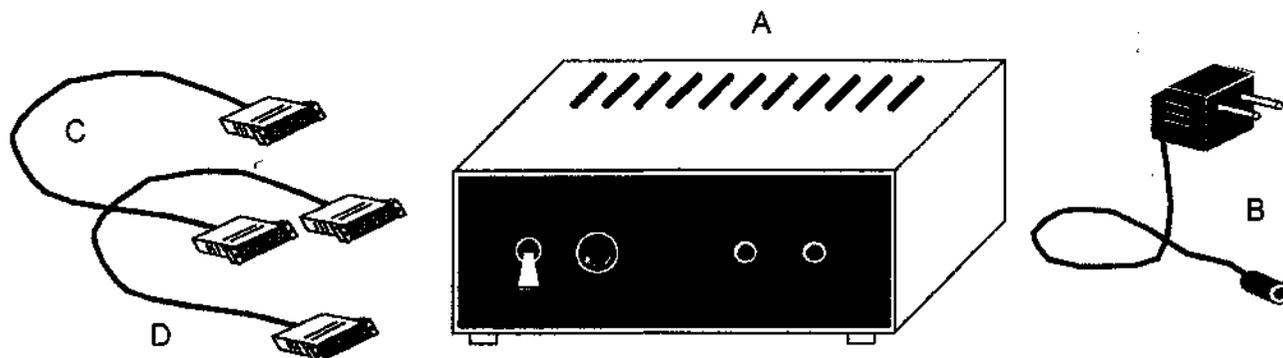

Figure 3.2: Interface kit for SARTORIUS balance (AS series).

The complete kit P/N 40106 includes:

A)   Interface unit.
B)   Power supply transformer
C)   9/9 pin connecting cable between interface and microwave unit.
D)   9/25 pin connecting cable between interface and balance.

How to connect the interface kit:

-   Connect the interface unit either to the microwave unit with the connecting cable "D" (as labeled) and to the balance with the connecting cable "C" (as labeled).
-   Connect the power supply transformer either to the interface and to the line supply 220V
-   Turn on the balance and set the parameters properly.
-   Turn on the interface unit and then turn on the microwave unit.
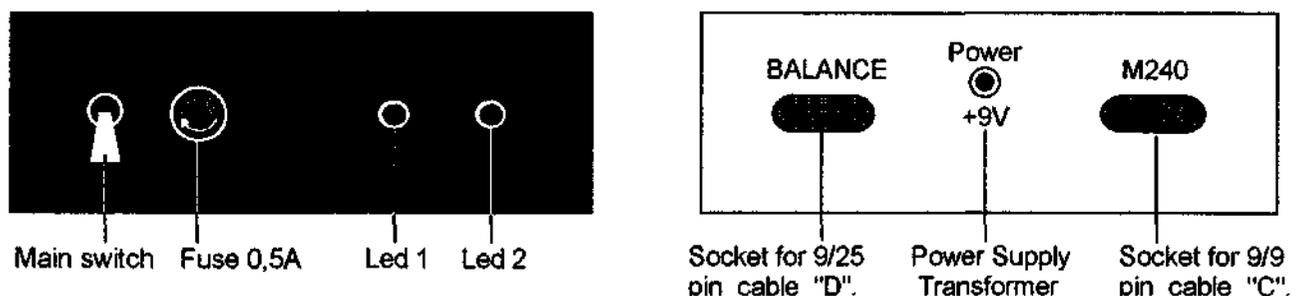
Figure 3.3: Front and back view of the Interface unit.

NOTE: - Under stand-by conditions Led 1 blinks fast while Led 2 is OFF.
        - During weighing data transmission, Led 1 blinks fast while Led 2 blinks slowly.

4. INSTALLATION

The installation of the MLS 1200 PYRO unit is the same as specified in the standard operator manual.

The printer and the balance have to be connected to their interface sockets on the back of the M240 Terminal Control. See figure 4.1.

PC RS232	BALANCE RS232	MICROWAVE	PRINTER CENTRONICS	ANALOG RS232
Serial I-face for PC	Serial I-face for balance	50 pins I-face for microwave unit	Parallel I-face for printer	Analog I-face for recording
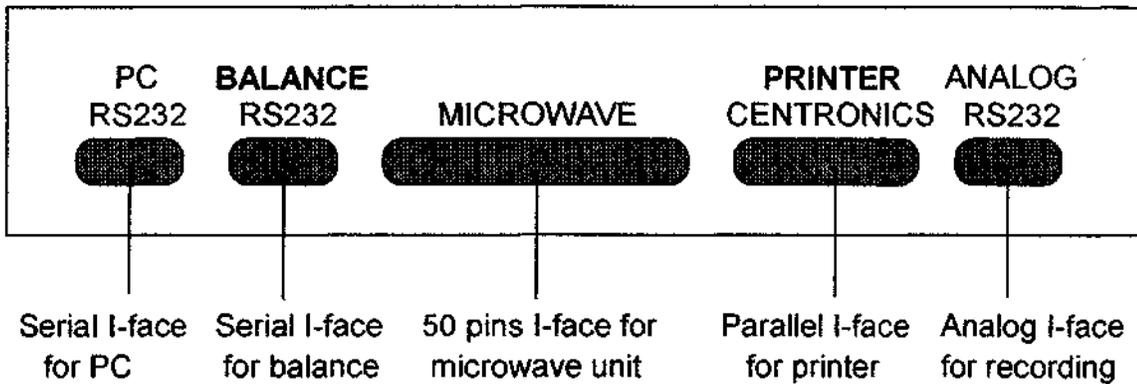
Figure 4.1: Backview of Terminal Conyrol M240

The suggested configuration of the complete system is the following:

Printer

MLS 1200 PYRO   M 240   Balance
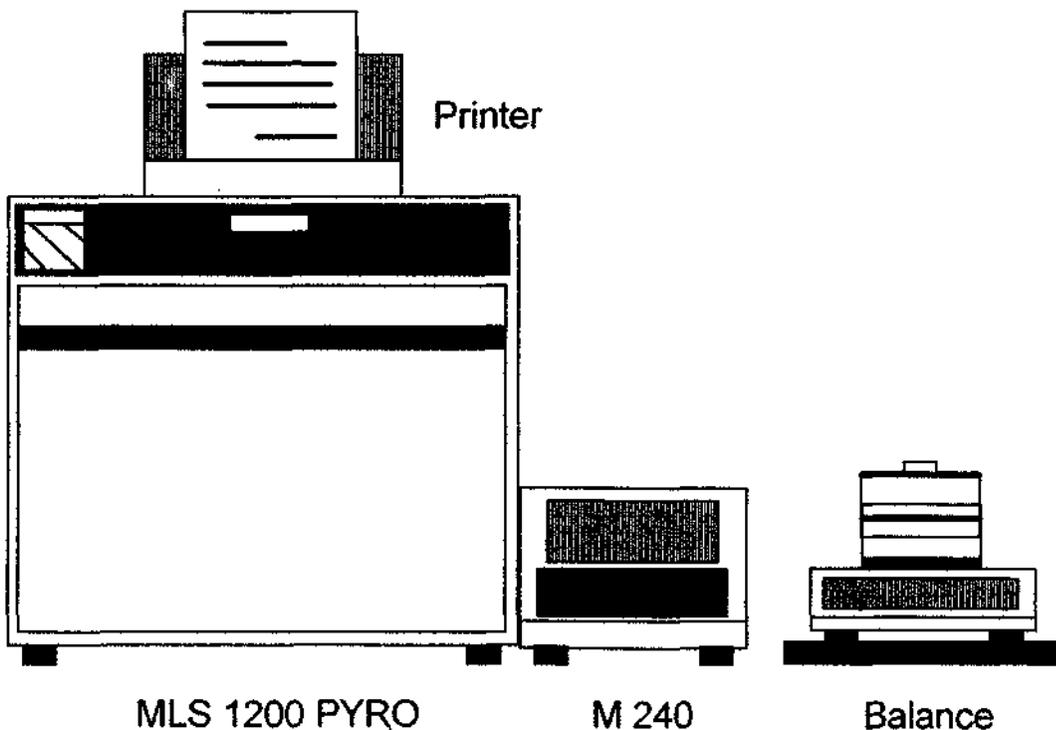
Figure 4.4: Configuration of the PYRO MultiQUANT system

The electrical connections of the complete system are shown in figure 4.5.
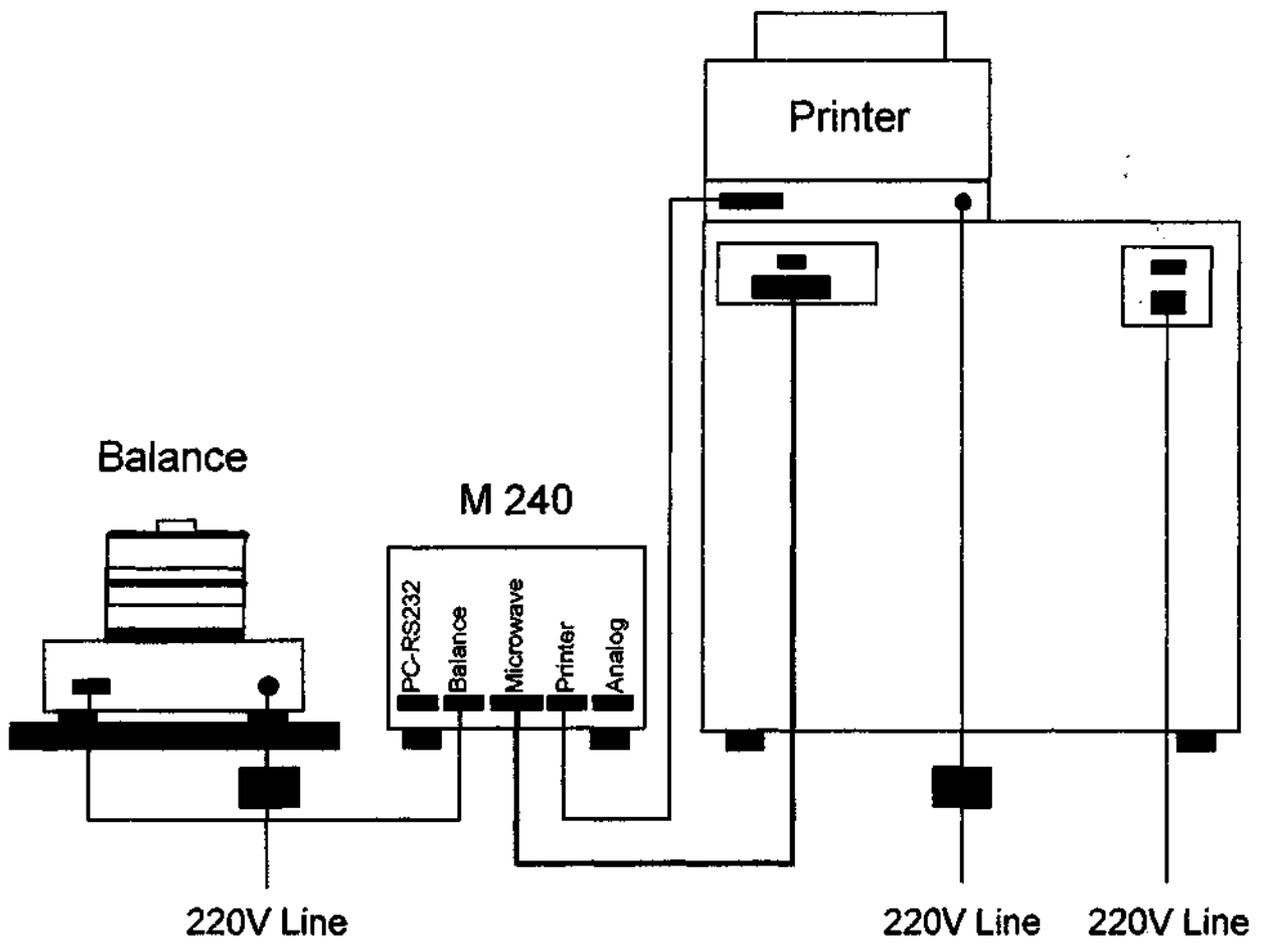
Figure 4.5: Backview of the PYRO MultiQUANT system

5. HOW TO OPERATE THE PROGRAM

Operator-program interface is constituited by keyboard and display on the terminal control M240 (see figure 5.1), which presents the same configurations as the standard software program illustrated in the PYRO Operator Manual.
This chapter will only cover those options which differ from the standard software 5.4.
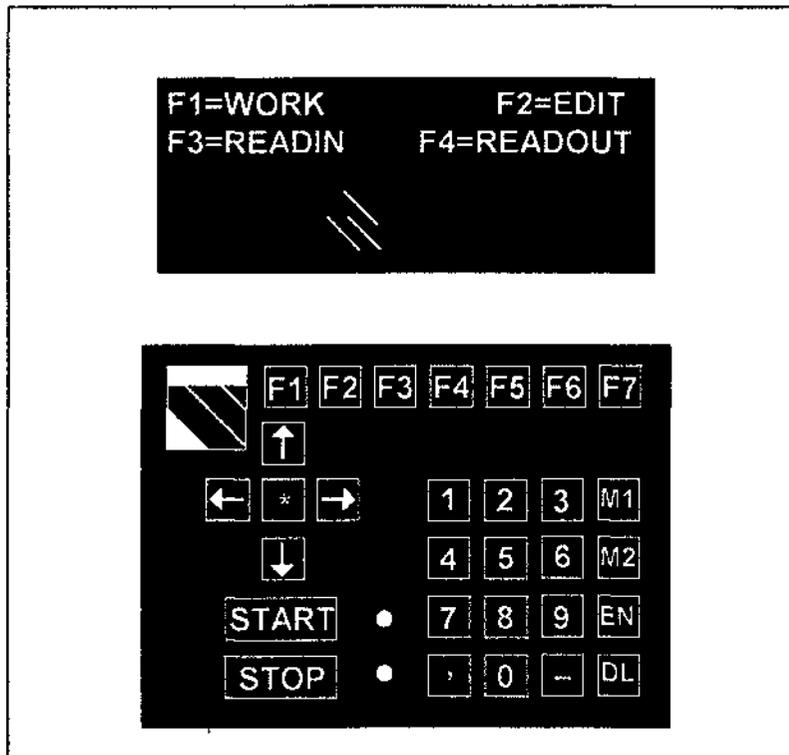
Figure 5.1: View of the display and the keyboard of M240

NOTE: From now on we will only consider the first two lines of the displayed program on the terminal control M240 to make the procedure easier.

Proceed as follows:

- Switch on the MLS 1200 PYRO MultiQUANT unit with the main switch on the front panel. The display will alternatively show:

- After 4 - 5 seconds the display will show:

```
F1=WORK          F2=EDIT
F3=READIN    F4=READOUT
```

Pressing "F1" or "F2" the operator acceeds to the installation, storage and using of the working program as already described in the PYRO Operator Manual so we will consider the new function keys "F3" and "F4".

- Press "F3"

```
ID .-NO:       (MLS GmbH)
                    ENT=OK
```

- Then introduce sample identification (max 9 letters) replacing the writing MLS GmbH.

ID.-NO: (MLS GmbH)

Use keys ⬆ ⬇ to go forward and backward in the alphabet.

Use keys ⬅ ➡ to write up on the wrong letters.

Use the key ▪* to swap from big to small letters.

Use the keys from "0" to "9" to put figures in the sample identification.

- Press "ENT" to confirm and have access to the following step

```
No. SAMPLES          _
(1-18)          ENT=OK
```

- Introduce the number of samples to be handled (for example: 2) and press "ENT"

```
1 TARA=         0,0000 g
0=ZERO          ENT=OK
```

- Now press the "0" key for the automatic tara of the balance; put on the balance tray the empty crucible and press "F3"; the weight of the crucible will appear on the display and will be acquired by the software.

NOTE: In case of unstable reading on the balance, the following alarm message will appear:

```
Balance not ready
Press a key
```

Wait until weight is stable and then press any key to delete the error message.

- The display will now show:

```
1 TARA+S=        0,0000 g
0=ZERO           ENT=OK
```

- Introduce the desired quantity of sample into the crucible checking its weight on the balance display. Once the desired weight is reached, press "ENT". The same weight will be displayed on the M240 terminal control, stored in the software memory and automatically printed out.

- The unit is now ready to store the tara and the weight of sample number 2; the display will show:

```
2 TARA=          0,0000 g
0=ZERO           ENT=OK
```

- Weighing procedures are the same as for sample number 1. Once also the weight of the second sample has been stored, pressing "ENT" the software resubmits the procedure of the first sample to allow reweighing in case of error:

```
1 TARA=          0,0000 g
0=ZERO           ENT=OK
```

- If everything is O.K. press "STOP" to stop the routine of initials weights. Following is an example of a report as given by the printer.

```
ID: 000000001          10.02.96   11:48:35

READ-IN  SAMPLE-WEIGHTS (RESIDUE)

         TARA1      TARA1+S    SAMPLE
         (g)        (g)        (g)
   1     26.8600    30.6060    3.7460
   2     23.9570    27.7030    3.7460
```

- The display will now show :

```
F1=WORK        F2=EDIT
F3=READIN   F4=READOUT
```

- The ashing procedure of the two samples weighed so far can be started pressing "F1". This will open the selection of heating programs as described in the Operator Manual:

```
WORK PROGRAM        *1
(1-30)              ENT=OK
```

- The operator has only to select the working program among the stored ones (according to the type of samples to be ashed) and to introduce the crucibles into the working chamber, close the muffle and the door of the unit and then press "START".

NOTE: The performance of the microwave unit, during and at the end of the heating process, is exactly the same as with the standard version.

- At the end of those operations, the cooled down crucibles can be reweighed recalling the following menu:

```
F1=WORK        F2=EDIT
F3=READIN   F4=READOUT
```

- Press "F4" (READ-OUT: reading of final weights).

NOTE: Remember that the software keeps in memory the previously stored initial weights until it is switched off. Therefore this procedure must be carried out at the end of the ashing procedure.

- The display will show:

```
1 TARA+S=        0,0000 g
0=ZERO           ENT=OK
```

- The software is now waiting for weight of the crucibles and the residue. Tare if necessary, the balance with the "0" key and then put on the balance tray the crucible containing the first sample. Press "ENT" to store weight, which will be automatically printed out; then proceed to the second sample:

```
2 TARA+S=        0,0000 g
0=ZERO           ENT=OK
```

- Reweigh the second sample and press "ENT".
The software will resubmit the first sample display in case any correction is necessary.
If everything is correct, press "STOP".
Following is an example of a report as given by the printer:

READ-OUT SAMPLE-WEIGHTS (RESIDUE)				
	RESIDUE		VOLATILE	
	(g)	(%)	(g)	(%)
1	1.5360	41.00	2.2100	59.00
2	1.5370	41.03	2.2090	58.97
MAX-D: 0.01%	STD-D: 0.01%		AVG-D: 58.98%	

- The software will go back to the main menu, ready for new samples.

Cancellation of Sample Weights

In case during weighing (READIN/READOUT), there are one or more errors (sample lost or burnt, defective vessel, etc.), it is not necessary to repeat the complete sequence but single values can be rejected with the readout step: inserting the number of the wrong value, an exclamation mark will appear beside it and the value will remain out of the statistical calculation. This procedure is reversible! If the operator enters the new number and press the "DEL" key, the exclamation mark will be cancelled and the value will be still valid.
Before quitting with the "STOP" key, it is suggested to press the "F5" key to have printout of the modified values. In the following example we have 6 sample; 1,2,6 are ignored.

READ-OUT SAMPLE-WEIGHTS (RESIDUE)				
	TARA+R	RESIDUE	VOLATILE	
	(g)	(g)	(g)	(%)
1	19.2770	0.5580	0.5680	50.44!
2	19.8550	1.1450	1.1380	49.85!
3	20.4520	1.7330	1.7080	49.64
4	21.0190	2.3000	2.3050	50.05
5	21.5820	2.8660	2.9000	50.29
6	22.1680	3.4600	3.4590	49.99!
MAX-D: 0.26%		STD-D: 0.18%		AVG: 48.89%

The statistical values in the last line are:
- MAX-D: Maximum deviation from average.
- STD-D: Standard deviation.
- AVG: Average value.

6. MULTIQUANT® MODE STRUCTURE

WORK ◄— F1 ──────────┐   ┌────── F2 ►► EDIT

```
                    ┌──────────────────────────┐
                    │ F1=WORK        F2=EDIT    │
                    │ F3=READIN   F4=READOUT    │
                    └──────────────────────────┘
```

F3

```
┌──────────────────────────┐
│ ID .-NO:       (MLS GmbH) │
│               ENT=OK      │
└──────────────────────────┘
```

ENT

```
┌──────────────────────────┐
│ No. SAMPLES               │
│ (1-18)        ENT=OK      │
└──────────────────────────┘
```

ENT

1 TARA=	0,0000 g
0=ZERO	ENT=OK

ENT

1 TARA+S=	0,0000 g
0=ZERO	ENT=OK

ENT

2 TARA=	0,0000 g
0=ZERO	ENT=OK

ENT

2 TARA+S=	0,0000 g
0=ZERO	ENT=OK

ENT

18 TARA+S=	0,0000 g
0=ZERO	ENT=OK

ENT   STOP

F4

1 TARA+S=	0,0000 g
0=ZERO	ENT=OK

ENT

2 TARA+S=	0,0000 g
0=ZERO	ENT=OK

ENT

18 TARA+S=	0,0000 g
0=ZERO	ENT=OK

STOP   ENT

```
┌──────────────────────────┐
│     REPORT PRINTOUT       │
└──────────────────────────┘
```

7. FUNCTION KEYS

Operating with the cursor-keys it is possible to rapidly move throughout programs and steps.

arrow down cursor: to insert the same parameter in the following step.

arrow up cursor: to insert the same parameter in the previous step.

arrow forwards: to insert the next parameter in the same step.

arrow backwards: to go back to the previous program step.

Keys from "F1" to "F7" have the following functions:

F1 = WORK: to call a working program and to run it after confirmation.

F2 = EDIT: to create, modify and delete programs or part of a program.

F3 = READIN: to go to the multiQUANT menu for volatiles determination.

F4 = READOUT: for reading of final weights. If no previous weights are available, the display will give "READOUT IMPOSSIBLE".

F5 = HARDCOPY: printout of the display. If the printer is not connected the display will show "PRINTER NOT READY"; if the printer is on-line, printout will be started pressing any key at operator's choice.

F6 = SYSTEM: to configurate the system. To enter date and time and independent use of the balance.

F7: NOT AVAILABLE.

About other keys:
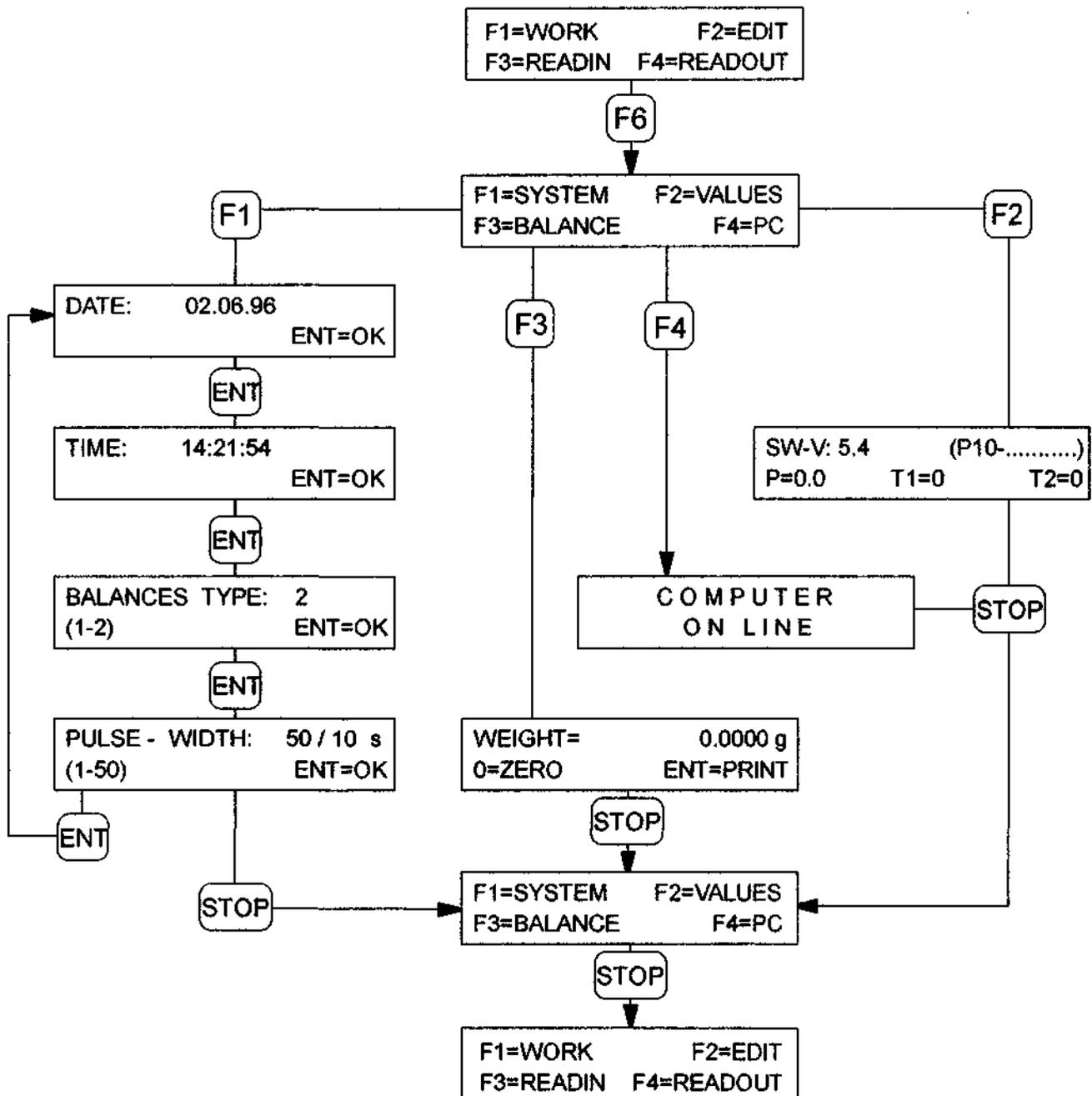
MODE 1: NOT AVAILABLE.

MODE 2: NOT AVAILABLE.

DELETE: to delete stored programs.

ENT ENTER: to confirm any choice.

8. SETTING OF FUNCTIONS

Except during program running, it is possible at any time to set different functions by simply pressing the "F6" key. Among these functions there are also print-out of test reports, as well as independent use of the balance. The relative sub-menu is shown in the following diagram.

```
                    ┌─────────────────────────────┐
                    │ F1=WORK          F2=EDIT     │
                    │ F3=READIN   F4=READOUT       │
                    └─────────────────────────────┘
                                  │
                                [F6]
                                  ▼
        ┌──────────┐  ┌─────────────────────────────┐  ┌──────┐
      [F1]         ──│ F1=SYSTEM      F2=VALUES     │──        [F2]
                     │ F3=BALANCE          F4=PC    │
                     └─────────────────────────────┘
   ┌────────────────────┐      │          │
   │ DATE:   02.06.96    │    [F3]        [F4]
   │            ENT=OK   │
   └────────────────────┘
          [ENT]                              ┌──────────────────────────┐
   ┌────────────────────┐                    │ SW-V: 5.4    (P10-.........)│
   │ TIME:   14:21:54    │                    │ P=0.0    T1=0      T2=0   │
   │            ENT=OK   │                    └──────────────────────────┘
   └────────────────────┘
          [ENT]
   ┌────────────────────┐                    ┌──────────────────────────┐
   │ BALANCES TYPE:  2   │                    │   C O M P U T E R        │   [STOP]
   │ (1-2)      ENT=OK   │                    │     O N   L I N E        │
   └────────────────────┘                    └──────────────────────────┘
          [ENT]
   ┌────────────────────┐  ┌──────────────────────────┐
   │ PULSE - WIDTH: 50/10 s│ WEIGHT=        0.0000 g  │
   │ (1-50)     ENT=OK   │  │ 0=ZERO     ENT=PRINT     │
   └────────────────────┘  └──────────────────────────┘
       [ENT]                        [STOP]
                                      ▼
                      ┌─────────────────────────────┐
            [STOP] ──▶│ F1=SYSTEM      F2=VALUES     │◀──
                      │ F3=BALANCE          F4=PC    │
                      └─────────────────────────────┘
                                   [STOP]
                                      ▼
                      ┌─────────────────────────────┐
                      │ F1=WORK          F2=EDIT     │
                      │ F3=READIN   F4=READOUT       │
                      └─────────────────────────────┘
```

<u>**NOTE:**</u> Function keys are not active during running of a program.

8.1   DESCRIPTION OF FUNCTIONS

F1=SYSTEM: Function setting includes time, date, type of balance and pulse for the magnetron. Attend very carefully to the following instructions.

- Date / Time: Date and time must be introduced in the preset format which appears on the print-out.

- Balance Type: The standard type of balance setting is 2 for the most important balances: METTLER, SARTORIUS etc.

- Pulse Width: The standard setting for pulse width time is 50/10 seconds (i.e. 5 seconds). Microwave power is therefore regulated by switching ON/OFF of the magnetron for a total time of 5 seconds as in the following examples:

1000W   equals to   5 seconds ON   and   0 seconds OFF
500 W   equals to   2.5 seconds ON   and   2.5 seconds OFF
400 W   equals to   2 seconds ON   and   3 seconds OFF
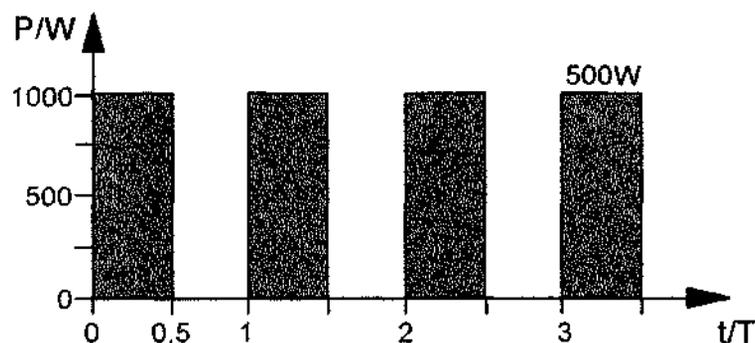
If the operator selects 10/10 instead of 50/10 (T=1 second):
1000W   equals to   1 seconds ON   and   0 seconds OFF
500 W   equals to   0.5 seconds ON   and   0.5 seconds OFF
400 W   equals to   0.4 seconds ON   and   0.6 seconds OFF
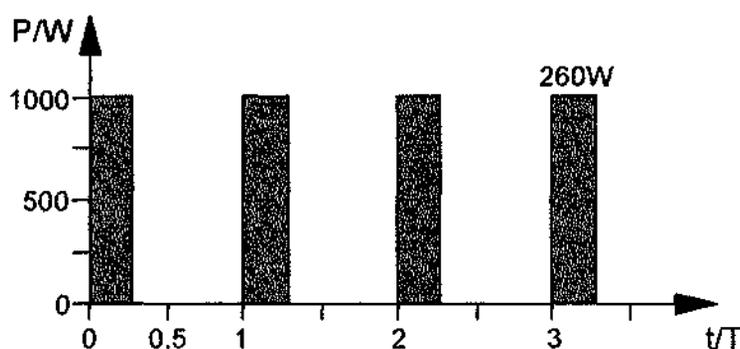
Formula for microwave power (PMW):
tAN= AN-Magnetron time
T=Pulse Width

$$PMW= 1000W\ \frac{tAN}{T}$$

NOTE: Never use lower than 50/10 seconds pulse width for routine operations.

F2=VALUES: Pressing "F2" the operator can see the type of software and the options (temperature, pressure automatic controls) installed/allowed in the system.

F3=BALANCE: The balance will read only stable weights. Press "ENT" to obtain print-out of the first stable weight of the balance.

F4=PC: Operating mode in which the microwave unit is connected, through a serial interface, to a P.C. for remote control, setting and/or modification of working programs and storing them into the P.C. memory.

8.2 PRINT-OUT OF HEATING PROGRAMS

When the display shows:

```
WORK PROGRAM          *1
(1-30)              ENT=OK
```

it is possible to obtain printing of the desired program (in the example *1) by pressing the "F5" key. Here is an example of a heating program printed report:

```
START = RUNNING  PRG.                    *1
P=0.0                 T1=0              T2=31
```

STEP	TIME	POWER	PRESS	TEMP1	TEMP2
1	00:20:00	800W	0B	0°C	250°C
2	00:30:00	900W	0B	0°C	650°C
3	00:15:00	750W	0B	0°C	700°C
4	00:00:00	0W	0B	0°C	0°C
5	00:00:00	0W	0B	0°C	0°C
6	00:00:00	0W	0B	0°C	0°C
7	00:00:00	0W	0B	0°C	0°C
8	00:00:00	0W	0B	0°C	0°C
9	00:00:00	0W	0B	0°C	0°C
10	00:00:00	0W	0B	0°C	0°C

VENT= 00:30:00