

# MISS

# BOWLING

# TURBO

Manual for exploitation and service

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The Miss Bowling Turbo is the logical continuation of its predecessor: the Miss Bowling.

In the last years the Miss Bowling Turbo is known as one of the best `Money-makers` on the market. It is a logical step forward, caused by many tests and improvements on the Miss Bowling, and comes with new possibilities and features.

The basic program, MTV 1.0 , is the largest program ever written for a Bingo. (it has 24 Kbytes; in comparison with the Miss Bowling, that has 16 Kbytes, and the Miss Bonus has 10 Kbytes)

Different service-simplifications and protections against cheating, were the outcome of the monthly meetings between technicians from various exploitators, and our own engeneering staff.

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## 1. FEATURES

The Miss Bowling Turbo is identical to its predecessor, with the following

additions:

- A fifth extra ball
- Progressive pots, extended with one digit, limited on 15.000 BFR in the 3 BFR/ 5 BFR mode and on 5.000 BFR on the points-mode
- An actual speeding-up of the machine
  
- The machine is produced in the so called `WIMI STYLE`  
It contains in the front a new door with 3 separate coin entrees  
Under that door, is an other door which gives access to the money-box  
The coins are inserted directly into the money-box.
  
- The playfield is made of poly-urethane and is covered with a dome of hard plexi glass. This plexi glass protects against dust and foul-playing.  
A plastic dome at the under side of the playfield makes sure of returning the ball into the gutter, and makes cheating from the under-side hard.
  
- Speed of the game has increased with 46%
- 90% of the CPU (PR328) as well as the other spare parts remain the same. (see also: hardware differences)
  
- WIMI security with switches on all entrees on the machine , such as: playfield, frontpanel, glass, doors, etc.  
  
The moment one of the switches is activated, the game stops.  
Only the Electronic Key, that is provided for the exploitants only is needed to de-block the game ( see chaptor: Electronic Key)
  
- WIMI security system, with dubble coinswitches to prevent so called `fishing the coins`
  
- WIMI MONITORING SYSTEM  
This will provide, via a printer , all information of all games played, but only in a short way. The system also notices the opening of doors, resetting indexes, faultcodes, tiltcodes, the amount of played and wonnen points, state of scores and the features, the position of the reflex, and even the date and correct hour of each played game.

-WIMI SERVICE SYSTEM via CONSOLE.

The console exists of a alpha numeric keyboard and a display

With this Console it is possible to give commands with the keyboard and receive information via the display.

The communication is in a not-coded, clearly visible way.

So it is easy to learn. There are various types of consoles available on the market. The connection between the console and the machine is via a 10-poled cable , connected to a RS-232 junction on the UART print.

This system can be connected to a Modem that can make communication possible on long distances. This connection can also be used to read the electric tellers, percentage, and balance.

-SOFTWARE Securities in the MTV 1.0 program:

- A security system with double coin-switches, as earlier mentioned  
When an irregularity occurs, a certain extended noise will be heard.  
It is possible to set the dipswitches, so that the game blocks and a special error code is displayed.
- Security against manual re-opening of the slide to regain already played balls.
- Security of the rollovers.  
When a rollover stays activated, the machine blocks, and when it is activated manually (cheat), the machine will tilt.
- Security of the ball-lifter and shutter motor.  
When a motor stays under tension longer than 15 seconds, the machine will give an error-code. The power to the motor is cut, to prevent burning.
  
- The doortilt is separated from the other tilts, this in order to get a better view on tilt caused by knocking on the door.
  
- The software for the electronic key is adjusted so that during playing a game, opening of the door is not affecting the game.
  
  
  
  
  
  
  
  
  
  
- NEW: The machine can make tilt in 24 different ways, depending of the security that is activated.  
Every cause has its own special tiltcode, the machine registrates the 22 last made tilts in his memory , they can be read out by the service-box

or console. (see also: chapter tiltcodes)

With the special dipswitch D1, one can disable the hangtilt during the start-up cyclus. (not the door-tilt!)

This hangtilt will be activated again once the first ball of a new game is launched. This admits to free eventually blocked balls during the start-up cyclus without causing tilt.

- By means of dipswitch H6 it is possible, if wanted, to disconnect the Electronic Key System. However, for this procedure, an adjusted electronic key is required.

## **2. HARDWARE DIFFERENCES.**

### **2.1 CPU PR 328**

Following modifications are installed:

- some IC s are replaced by faster types
- the crystal of 6,144 MHZ is replaced by a 9 MHZ type
- the IC s WIMI 01 and WIMI 02 of miss bowling are replaced by WIMI 03 and WIMI 04.
- Some Dipswitches have an other meaning.

## 2.2 All other prints stay identic, except:

- Print display pot: the display has one more digit, but this new display print can also be used for teh miss bowling.  
Ref MB=PR 245                      Ref MBT=PR 345

- Trough Switch Print : the print has one more switch for detection of the fifth extra ball . In the switchmatrix A this switch replaces the Pulslift switch, which is not longer used in the MBT.

Ref MB=PR 238                      Ref MBT=PR 338

- Print TLF INT : BY 164 is replaced by 4 seperate more heavy diodes ( 1 N4007)  
The used relais are a faster type (50 i./sec) , the series resistances for the tellers are 3,3 Ohm/5W in stead of 15 Ohm/5W  
Ref MB= PR 235                      Ref MBT= PR 335

- Service box print : An acces to Switch Matrix C is added to this print, so to connect the double coin switches.

Ref MB= PR 250                      Ref MBT= 350

The wiring to the coin switches on the door is altered. (They are now also located in SWM.C) A new flatcable is installed between the body and the head to make connection between Switch Matrix C and the service box.

- The mechanical counter : seeing that the machine counts with 24 impulses/sec there must be mounted faster counters.

## 3. DIPSW MATRIX

Regulations of the game, we will limit to sum up the differences between The miss bowling and the miss bowling turbo.



DIPSW A: the same

DIPSW B AND C: These were by the MB regulations for the amount of coins and points for the two coinswitches 1 and 2 ( the first is the one on the right)

The program MTV 1.0 foresees that for both connections either with two coin switches, as in the MB, or with a 3 double coinswitch in Matrix C.

This is detected with a diode in COL7-ROW8 in the Switch Matrix C.

This diode is placed during producing on print PR 350.

In the first case the cabeling is the same as by the MB (so 2 coin switch in matrix A) and remains the function of the dipswitches B and C identical.

In the second case the wiring is forseen of 3 double coin switches that is adapted in switch Matrix C via print PR 350.

In this case the functions of the dipswitches B and C are altered as follows:

2 bits coding the amount of coins

3 bits coding the amount of points

and this for the 3 coinswitches.

#### AMOUNT OF COINS

B6	B5	COIN SW 3
B4	B3	COIN SW 2
B2	B1	COIN SW 1

0	0	1
0	1	2
1	0	3
1	1	5

#### AMOUNT OF POINTS

C7	C6	C5	COIN SW 3
C4	C3	C2	COIN SW 2
C8	B8	B7	COIN SW 1
0	0	0	1
0	0	1	2
0	1	0	4
0	1	1	5
1	0	0	10
1	0	1	15
1	1	0	20
1	1	1	50

In this group C1 is only useful when a wiring with double coin-switches is connected.

If C1 is abled and an abnormal functioning of the coinswitches occurs, the game will block and give an error code EE19.

When power is set on again, the machine stays blocked and gives again error Code EE19.

To regain normal working mode, we must power of and power on with opened door. If C1 is not abled, the inserted coins will be cancelled, and a noise is heard. After the noise the coinswitched are active again.

The game is now in tilt-mode, with as code:91-----9c.

Dipsw D- This remains identic to the Miss Bowling, except D1

By the MBT the first push on the red button is always 3 Fr per point, and a first start on the select button is 5 Fr per point.

Therefore this dipswitch is now used for switching off the hang-tilt during the start-up cyclus, iff D1 is activated. At the moment that the first ball is in the playfield, the hang-tilt becomes active again.

In the case when double coinswitches are used, the doortilt stays active.  
It is connected with separated wiring in Switch Matrix C.

Dipsw E : identical to MB

Dipsw F : identical to MB

Dipsw G : identical to MB, with following expansions:

G5 on : option for fifth extra ball (if on)

G7 on : console

G8 on : monitor

The programs console and monitor are added in the version MTV 1.0.  
If the UART print, PR 230, is not connected, G7 and G8 must be OFF,  
otherwise the program will block each time the door is opened.

Dipsw H : identical to MB, except H1, H6, H8.

H1 : if ON , one will start the EPROM test and the key-module test (also  
see chaptor electronic key.)

H6 : This dipswitch is used to able or disable the working of the key-  
module.

If H6 is disabled and power is turned off and on again, without  
an electronic key connected, the electronic key module will get  
abled again.

Dipswitch H6 must remain in the OFF position in this case.

H8 : if ON : 3 Fr – 5 Fr.  
if OFF: Point Mode.

#### **4. The Electronic Key.**

4.1 This exists of three seperate parts:

- The key module
- The electronic key
- Wiring and switches

The key module is a printed connection , connected with the CPU via J709 and on which de electronic key is connected.

This print has an IC-foot with 24 pins for an EPROM type 2716-450 ns that has a coded discription of the key.

The CPU must always read the information from the EPROM and from the key and must compare it.

The key module also has a CMOS RAM and a battery. The CPU can read the information of this, and can change this. Power supply of this CMOS RAM comes from the network of contacts that secure different parts of the machine. From the moment that one of the contacts is activated, even if the machine is off power, all data that the CPU has written in the CMOS RAM, will be lost. During power on of the machine, the CPU will check the data if it is correct, and if the data is correct, the machine will start normally, and the contents of the CMOS RAM will be checked periodically.

If the data is not correct, an adjusted key must be connected on to the key module. When the key is recognized, the CPU will ignore the data from the CMOS RAM during the next sequence, so to allow to shut the door.

When the machine is turned on again, it will write data into the CMOS RAM, and Periodical checking will start again.

The above mentioned actions must strictly be followed, otherwise the security system will be activated; the machine blocks and gives following error codes: EB02, EB03, EB04 or EB05.

That is the reason a test procedure is needed, which was before not available, but now it is integrated in the MTV 01:

If , without any reason, an error occurs, one can find the location of the problem,

- The key module
- The key
- Or the wiring and contacts.

#### **4.2 Users Procedure of the key.**

If you want to open the machine, with turned on key module, you have two possibilities: power can be on or off.

In both cases the contents of the CMOS RAM will be destroyed by opening of one of the switches.

When power is on, the CPU will immediately detect it.

If the machine is not on power, it will only detect it while turning on power, and when no key is connected, error code EB02 will show.

This codes means that while turning on power, the information of the CMOS RAM was destroyed, and no key was connected.

In this case it is needed to connect the proper key, and re-power again. At this moment the machine must start up , and testing of the information stops, as long as power is on. Now the machine is available for servicing. At the moment power is turned off, and on again, the CPU will compare the contents of the EPROM with the contents of the CMOS RAM periodical.

If during the first check of the CMOS RAM, the contents appears fault, error code EB03 will be displayed. This means that the written data of the key in the CMOS RAM in not correct. (For example a switsch is still active, the key is out of order, .....)

Briefly summarized:

1. If you want to open the machine with power turned off:
  - Open the door and activate the doorswitch.  
Connect a key and switch the power on.  
At this moment, it is allowed to remove the key.
  - Now all switches may be opened, without the machine shutting off
  - Remove the key and shut the door
  - Turn off power, and on again, in order to activate the system.
  
2. If you want to open the machine with power turned on:
  - If the door is opened, all segments G will lighten up

At this moment one has 20 seconds to close the doorswitch, and to connect a key.

If the key corresponds with the EPROM, the machine will function properly. If however the key does not corresponds with EPROM, the error code EB05 will show in 20 seconds.

When the machine is NOT opened via the door, it will immediately show error code EB04.

So:

- Open the door, horizontal stripes will be visible.
- Pull out the doorswitch, and connect the key, the machine must function

- normal after 20 seconds.
- Machine is ready for servicing.
  - Remove the key, shut the door and activate the system by turning off- and on power.

### **4.3 Turning on and off the Electronic Key System.**

#### 4.3.1. Procedure to turn off the Electronic Key System (EKS)

For this we use only the dipswitch H6, that is in the normal OFF position. To turn EKS off, we follow the next steps:

- connect the proper key
- Put H6 in the ON position
- When we turn on power, the machine must show code E0E0, that indicates that the EKS system is disabled.
- After we turn off power, and on again, the switches now not have any influence.

Be careful: A total RAM clearance or alteration of the CPU will automatically bring the EKS back in working. To disable EKS again, please repeat the just above explained procedure.

#### 4.3.2. Procedure to turn on the Electronic Key System.

H6 in the OFF position .

Turn on power, and the machine will give code E1E1.

Now the EKS is back in working, so at the following powering-up, a proper key must be used.

### **4.4 Testing Program**

There are three different ways to call the testing program:

- During switching on the machine.
- During a game
- With the console

By running this testing program, the contents of the RAM in the Key Module will always be destroyed.

The Key Module exists of three separate parts that are tested:

- The EPROM that shapes the slot
- The CMOS RAM in the Key Module
- The key

In each part the testing program runs a large number of times. By doing this, it is possible to test our own key, as well as a standardkey EKTEST.

When the standardkey is correct, and our own key gives an error, this will indicate an error of the EPROM, or an error of our own key.

#### 4.4.1. Calling the testing program

When the testing program starts, the machine will block and even the service box will become inactive.

Step 1:

1. Set Dipsw H1 in the ON position
2. Connect the service box and put SVSW (SV1) in ON position
3. When the machine is turned on, the testing program begins. It will stay active as long as H1 and SERV are ON.

Step 2:

When power is on, the testing program will start when H1 and SERV are ON. The contents of the CMOS RAM in the Electronic Key Module will be destroyed, so if the EKM was active, the machine would go in code after the test.

Step 3:

The testing program can also be started by connecting a console, and type the command: EK (CR). It will only run once.

#### 4.4.2. Discription testing program for the Electronic Key Module.

First we see 4 times a C on the display, that indicates that the test has started. Next we see on the displays:

PMC	PEC
X A1 X X	X 80 00
1 2	3 4

A1: means that the tests of the CMOS RAM in the KM is running.

80: Is the amount of executed tests in hexadecimal  
Here it is: 80 H= 128  
(every cyclus exists of writing, reading and comparing)

00: The amount of noticed errors in hexadecimal.  
If the amount of noticed errors differences of zero, the test will be aborted, because proceding the test has no use, as either the CMOS RAM is defective, or there is still a securityswitch open.

If the amount of noticed errors is zero, zero than the tests will go on and the display will show:

PMC	PEC
X A2 XX	X 6425

A2: This indicates that the key and the EPROM in the EKM are tested.

64: Is the amount of executed test in hexadecimal (=100D)  
*\*\* (note : I think D means Thousand, as D stands for Duizend=Dutch for 1000)*  
25: Is the amount of failures of the test, in this case 25 H (=37D)

(This wrong- normally no failures may be reported.)

After this, the displays will show:

PMC	PEC
X A3 XX	X 80 00

A3: This indicates that the testing of the standardkey is in progress.  
(The standard key is available at our company)

After 128D test are done, the testing begins again

It is preferred to run the full test more than one time, before it is decided that all is in good working order.

It is also recommended to disconnect the security switches, and replace them



by a DIN-plug with one switch, so to detect wiring problems.

*This test is very complete, but be warned!!!!*

*!!!! A key wrongly connected will surely be damaged severely*

*!!!! All flatcables MUST be connected with the red wire to pin 1*

## **5. Console**

The program MTV 1.0 contains special routines by which a Console and a Monitor can be used.

For this we need a new print, mounted on the CPU.  
This print is called the UART-print.  
(Universal Asynchronous Receiver Transmitter)

### **5.1 Installation of the UART print PR 230**

This print is connected with a 50-poled flatcable to the Bus Extension of the PR 328 and a 4-poled cable that supplies power.

This power exists of 2 x 9 VAC (low power), that on the UART print is converted in plus 12 V and minus 12 V, so to gain plus VH and minus VH for the RS 232.

Be careful with connecting this cable: on the UART print, the free pin of the connector must point to the 50-pins connector and on the power, the free pin must point to the MATE N LOCK plug, that goes to the playfield.  
The last cable to be installed is the one for the RS 232 connection that is placed in front of the door.  
RS 232 is the name of a standard connection with 25 pins, by which it is possible to connect the machine to various microcomputers or terminals.

## 5.2. The Console

At the front of the door, we have a possibility to connect the console  
There are a lot of types available, but for the use `in the field` they must be portable and thus as small as possible.  
We prefer the model 12 made by GR Electronics, that has a full ASCII keyboard and a 12-digit alpha numeric display.  
An alternative model with a display with 8 digits is known, that is also good to use.  
In both models the display consists fictive of 32 digits, of which on the same moment only 8 or 12 digits can be summed up, by moving these over the total display length.

The working of a console is simple:  
By pressing a key, the corresponding ASCII-code is being transmitted.

For example: if the A is pressed, then the console will transmit on the XMIT-line a 10-bit code similar to an ASCII A.  
The CPU will also transmit a 10 bits ASCII code on line RX, so that the A will appear on the display of the console.

That is the principle of the I/O of the console, the rest is for the program.

Every key on the keyboard has a different meaning. To make the difference, we use the SHIFT key.  
The principle of dialoge with the machine is always the same:  
We type in a succession of characters, called commands.  
After the CPU receives our commands, it will resend these commands in a way that they are visible on our display.  
When the command is typed in correctly, we ask for execution of the command by sending a CR (Carriage Return) .

On the moment the CPU receives a CR, it will interpret it as a command, decode it and execute it.

First Step:

Decoding the commands.

The CPU will know what to do with the command. If one of the characters of the command is wrongly typed, it will not be able to interpret, and will ask: WHAT?. So one needs a list with all valid commands, that can be executed by the CPU.

Second Step:

Executing a command.

If there is no syntax-mistake in the command, it will be executed after typing CR, and the CPU will answer with OK.

Now the next command can be issued. If this is a command that can give us certain information, the CPU will give it in ASCII code, and send it to the console display.

### 5.3. The Commands

When connecting the console, the CPU will answer with HELLO

#### 5.3.1. Syntax

A very simple syntax is chosen to do this:

In fact we ask the CPU to read or write the RAM memory.

To read information, one simply types the name of the subject we want to read, followed by a CR.

To write information one types the name of the subject we want to write, followed by an = , and then the data we want to write.

For Example: We want to read the state of the reflex;

We type : REFL (CR)  
The CPU answers: 103.200

For Example: We want to change teh reflex;

We type : REFL=44125 (CR)  
The CPU answers: OK , by this message CPU says that the value we typed is now the current value.

This principle works with all commands.

### 5.3.2. Discription of the commands

Manipulation of the indexes:

In the machine there are 3 groups of electronic counters, that together with the mechanical counters , do the counting

Every index exists of 4 bytes = 8 ciphers

TLFI  
TLFO  
TOTI  
TOTO  
CASH

Group 1 : This group can be used as a monthly counter.

Group 2 : This is only used for the working of the super reflex,  
by this group of counters the percentage will be calculated, and eventually corrected.

Group 3 : This group is used as copy for the Electro Mechanical counters.

The figures that are printed by the monitor program are from group 3.  
(see chapter : Monitor)

Command I (CR)

For example, will answer with: I=2

This indicates that at this moment we are working with the counters of group 2

If we want to read or change group 1 we type: I=1 (CR)  
The machine will reply with: OK

Commands TLFI (CR)  
          TLFO(CR)  
          TOTI (CR)  
          TOTO (CR)  
          CASH (CR)

Will show the state of the relevant counter of group 1

Example: we type TLF I=44 (CR)

The machine will reply: OK  
The contents of TLFI is at this moment 00000044

Command CLEAR (CR)

With this command we will set the counters of group 1 to zero.  
For all security, the CPU will first ask us in what group this must be done.

Example: CLEAR (CR)

The machine asks: I=3?  
We type : Y (yes)

The machine will reply with OK , and the 5 counters of group 3 are on zero.  
Command PROG (CR)

The machine will reply with : MTV 1.0 as this is the software the CPU is equipped with.

Command DEL (CR)

With this command we can erase a typed error, which we already inserted.

Command Z ( no CR is needed!!)

With this command it is possible to transfer the last inserted information of the command interpreter buffer into the console display.

Command (CR)

This command will recover the last command that is taken by command Z, and execute it .

Reading and writing the memory of the CPU:

Example: M=8080 (CR)

The machine will reply: 4A5F8D

This means that the memory position 8080 contains data 8D

8081	5F
8082	4A

Now we type: M=8080 = 8A

The machine replies : OK

That means that data 8A is now located on adress 8080.

For this command it is necessary to use 4 digits for an adress and 2 digits for a data.

For example: to set data 4 on adress 54D, we must type:

M=054D=04 (CR)

For the address and data in hexadecimal form, only ciphers 0 to 9 are permitted, and for letters, only A to F are permitted.

If any other symbol is used, the machine will reply: ERROR 04

Command: ????(nothing stated in the book)

This command will display the calculated percentage in group 1:

TOTO

X 100 = %

TOTI

And this at 2 figures after the comma.

Command: BAL (CR)

With this command, balance is made in group 1, the balance is preceded with a + or a - . In principle, the balance should be zero.

BALANS=(TOTO+TLF+CASH) – (TOTI+TLFO+RPREG)

RPREG is the value of the replay register, on the moment the calculation is executed.

Command REFL (CR)

REFL=XXXXXX: 1 to 6 ciphers  
Allows us to read and alter the state of the reflex.

Command TCODE (CR)

With this command we bring up the 22 tilt-codes on the display.

By TCODE we receive the tiltcodes, and every time we press T we get the next tiltcode.

To leave the tiltcode buffer, we press S.

We must do this, otherwise the pocket terminal will block.

Command POTM= xxx xxx (CR)

POTE= xxx xxx (CR)

With this command, we can read and alter the state of POTM and POTE.

If by mistake a value higher than 15.000 is booked, this will be corrected the first time that the POT should rise.

Command CLME M (CR)

With this command we do a total clear of the CMOS RAM memory of the CPU.

It results in an error code EE13

Command EK ON (CR)  
EK OFF (CR)

With this command we can able or disable the Electronic Key System.  
To disable the system we need the Key.

Command N PRINT (CR)  
N PRINT = XX (2 hexadecimal characters)

With this command we can determine after how many games we want to set a record on the printer in the monitor mode.

For example: N PRINT= 00 or 01

That means we want a record of every game

N PRINT=0A

That means we want a record every 10 played games.

N PRINT=FE

In this case the printer will only print a record everytime the power is set on, but also error codes and opening of the door will be registered.

Command NAME (CR)

NAME=XXXXXXXX (CR)

Maximal 8 characters

This command allows us to write a short message after each record.  
(ex: number of the machine, or name of the pub)

Clock

The CPU PR328 contains a Real Time Clock that remains on power with the battery that also powers the CMOS RAM.

First application of this clock is to provide every record in the monitormode of day,month and hour.

With the console, we can change and read the time.

Reading of the date:

Type: D (CR)

The machine will reply: 07/01

Reading of the hour:

Type : H (CR)

The machine will reply: 14 H 25

Inserting date:

Type : D=04/02 (CR) (Always use 2 characters, separated by a / )

Inserting the hour:

Type : H=10 H34 (CR) (Always use 2 characters, separated by an H )



This clock is not indispensable for the use of the monitor program; most CPU's are not equipped with a clock.

With a trimcondensator on the CPU , a clock can be installed.

Command CRED = XXX XXX (CR) ( 1 to 6 digits)

This command allows us to put points onto the RPREG.

This is only possible when the door is opened.

Command POINT = 78A4 (CR)

This command will place the see-index on the adress 78A4.

So in co-operation with the service box we can jump directly to the adress we want, without using plus/minus 1.

Command NGAM (CR)

NGAM = XXX XXX (CR) (1 to 6 digits)

This command allows us to read and change the number of the successive games.

This number will always be printed at the beginning of each record.

Command EK\_(CR)

This command will test the EKM in 1 cycle  
(see also chapter E.K.)

This test will destroy the contents of the RAM memory of the EKM.  
To avoid an error code after the test, the key must be connected.

Command KEYTEST (CR)

If a key is connected , it will be tested without loss of contents of the CMOS RAM.

The machine will reply with a number between 00 and 64.

If machine replies with 64, it means : 100 % correct.

#### Command EXE = XXXX (CR)

The 4 X must be an address of a sub routine that is ended by a Return.  
This will allow us , if we know the addresses of the program, to run special testing programs.

#### Command RESTO (CR)

This command will pull up the Trip tilt, activate the Game trip, and make it possible to pay-out the difference , as well as the POTS.

#### Command CLT (CR)

This will reset all tiltcodes.

### 5.3.3. Short form command format

PROG  
Z  
(CR)  
(DEL) (CR)  
I (CR)  
I=X (CR) X=1,2,3  
TOTI (CR)  
TOTO (CR) 1 TO 8 FIGURES  
TLFI (CR)  
TLFO (CR)  
CASH (CR)  
CLEAR (CR) I=X? : Y=OK  
CLMEM (CR)  
TCODE (CR)  
POINT =XXXX (CR) XXXX=Hex AD  
M XXXX (CR) 3 Loc Display M XXXX = XX(CR) XXXX=Hex AD XX=Hex data  
NAME (CR) NAME=XXXX (CR) 1 TO 8 CHARACTERS  
NGAM (CR) NGAM=XXXXXX (CR) 1 TO 6 FIGURES  
NPRINT (CR) NPRINT=XX 2 Hex. CHARACTERS

FE= STOP RECORD

EKON (CR)

EKOFF (CR)

H (CR)           H=XXHXX

D (CR)           D=XX/XX

% (CR)

BAL (CR)

REFL (CR)       REFL=XXXXXX (CR)   1 TO 6 FIGURES

CRED= XXXXXX (CR)           1 TO 6 FIGURES

POTM= XXXXXX (CR)           1 TO 6 FIGURES

POTE= XXXXXX (CR)           1 TO 6 FIGURES

EK (CR)

KEYTEST (CR)

EXE= XXXX (CR)   XXXX=Hex Adress

RESTO (CR)

CLT (CR)

## 6. Monitor

The monitor is abled with dipswitch G8, the UART print must be mounted.  
The monitor actually only sends characters.  
It can therefore be simultaneously connected with the console. (which can send and receive )

### 6.1 What is registered?

- The data of the game  
They exist of a RECORD , that uses three lines of 80 characters.  
The monitor program will itself generate a CR, LF after the 80<sup>th</sup> character of every line.
- By turning on the power, the state of the dipswitches and the version of the program will be printed.
- When the door is opened, the monitor program will detect this, and print a RECORD.
- When the machine gets an error-code, the monitor program will also print a RECORD
- Also, when a group of indexes is set on zero, with Key switch ON, and the X-button, a RECORD is printed

- When the machine goes tilt, the tiltcode will be printed.

## 6.2 Size of a RECORD

The differend data are separated by a dash.

The first line of 80 characters exists of the following information:

- 6 characters represents the number of the record
- 2 characters represents the value of what was played ( 3 Fr. Or 5 Fr.)
- 6 characters : TOTI of the played games in Franks (*Belgium currency*)
- 6 characters : TOTO „ „ „ „ „ „ „
- 6 characters : TLFO : The amount of points tikked off by telephone in group 3
- 4 characters : The amount of Franks, used for extra balls
- 6 characters : super reflex counter
- 4 characters : the calculated value of the super reflex
- 2 characters : super reflex is ok, or not ok

- 6 characters : reflex
- 6 characters : POT MAIN CARDS
- 6 characters : POT EXTRA CARDS
- 2 characters : BONUS
- 4 characters : the first four figures of the amount of the replay register

The second line of 80 characters:

- 2 characters : continuation of the replay register
- 2 characters : EXTRA BALL STEPPER : gives respectively 4-7-OA-OD-10H for the 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup>, and 5<sup>th</sup> extra ball.
- 8 characters : TOTI of group 1
- 8 characters : TOTO of group1
- 8 characters : TLF I of group 1
- 8 characters : TLFO of group 1
- 8 characters : CASH of group 1
- 6 characters : replay register RED
- 6 characters : replay register YELLOW
- 6 characters : replay register GREEN
- 6 characters : replay register WHITE
- 1 character : Score Stepper RED

The third line of 80 characters:

3 characters : Score Stepper YELLOW, GREEN, WHITE

2 characters : selection A B C D Stepper

14 characters: TRIP RELAIS : 8 OR F=ON 0=OFF

1 character = 1 trip

Tilt-Extra ball-TBEF4-TANY2-TANY3-T4 STARS AS 5- T Diagonals-  
TBEF 5- T Extra Ball- T Corner – T Rollover – T Bonus – T POT OK -  
TSELB5

26 characters: The 25 Hole Switch (the 26th character is not counted) , respectively the  
ciphers 1 to 25

8= closed contact

0=open contact

10 characters : Date + Hour + reduced reflex

Example: 1401112760

Means : january 14<sup>th</sup> eleven o clock 27 minutes reflex DCR 60

Then follows the name NONAME, when nothing is filled in with the code  
NAME. (see chapter Console)

### 6.3 Usable Printers

All printers can be used, if they have a RS 232 connection.

The status of the printer is 300 BAUD, 1 start bit, 2 stop bits, no parity control.

The printer must likely have (not necessary) 80 characters per line, but  
preferably have an input-buffer, because the CPU (after an LF-CR) directly  
sends the next information.

It is better to use a printer that not produces a lot of noise, and uses thermal paper.

The printing of a record occurs when one launches the first ball, so the printed record  
is always of the previous game.

## 7. The tiltcodes

For every way tilt can be caused, there is a special code.  
This information is written in memory position TTILT.

Codes:

81-82: Tilt caused by switching on the game.

83 : Tilt caused by a ball surplus on the playfield, when one presses the R-button.

86 : Tilt caused by pulling back the board under the playfield.

88 : Tilt caused by too long closure of CSW 1 or CSW 2, in the model with single coinswitches.

89 : Tilt caused when points are reduced by the use of the OUT-button on the TLF box

84 : Tilt caused by the Red Rollover remaining closed.

85 : Tilt caused by the Yellow Rollover remaining closed.

80 : Tilt caused by Hangtilt.

87 : Tilt caused by manual bringing up a ball.

8A : Tilt caused by the Hangtilt, though by putting up points.

91-92-93 : Tilt caused by usage of double coin switches, because the switches stay closed too long.

94-95-96 : Tilt caused by usage of double coin switches 1-2-3, whereby the upper and down switch is operated at the same time.

97-98-99 : Tilt caused by closing the upper switch twice, without closing the down switch.  
9A-9B-9C : The down coin switch is closed, before the upper switch settles down.  
9D : Tilt caused by the doortilt, by usage of double coin switches.

## **8. The error codes**

EE13 : The CMOS RAMs have lost information, for example if everything is cleared.

EE07 : STACK TEST : will be tested before the program begins.

ECXX : RAM TEST : XX= HIGH BYTES of the wrong adress.

EAXX : CKSUM ROM : XX= next ROM AD High Byte.

EE08 : letters in the RPREG or in the POTS.

EE09 : STACK LEVEL : an abnormal course of the program.

EE06 : Abnormal value of the RPREG.

EE12 : Abnormal value of the multiplication-coefficient.

EE14 : Rollover RED is closed longer than 15 seconds (door closed)

EE15 : Rollover YELLOW is closed longer than 15 seconds (door closed)

EE16 : Lifter Motor stays under power for more than 15 seconds.

EE17 : Shutter Motor stays under power for more than 15 seconds.

E0E0 : Electronic Key is disconnected.

E1E1 : Electronic Key is connected.

EE19 : By usage of double coinswitches, (so C1 =ON) : when something abnormal occurs.

EB02, EB03, EB04, EB05 : see Electronic Key.

## **9. Timing Information**

The PR 328 for the MBT operates with a frequency of 9 MHZ.

CLK= 4,5 MHZ

CLKA= 2,25 MHZ

CLKB= 1,125 MHZ

Interrupt request : 73 KHZ = 13,68 ms

Scancyclus of the 8279 = 11,37 ms

The CLK of the PSG must be adjusted on 1,789 MHZ, or 0,558 ms



## 10. Adress List For MTV 1.0

BONUS STEPPER	8005	
POT Extra Card	8006	
Pot Main Card	8009	
PR REG	800C	
REFLEX	8015	
TLFI group 1	8018	
TLFO group 1	801C	
TOTI group 1	8020	
TOTO group 1	8024	
CASH group 1	8028	
RTLFI group 2	802C	for super reflex only
RTLFO group 2	8030	
RTOTI group 2	8034	
RTOTO group 2	8038	
RCASH group 2	803C	
CTLFI group 3	8040	
CTLFO group 3	8044	
CTOTI group 3	804C	
CCASH group 3	8050	
Trip OK	807F	
Trip EB	8081	
Trip Tilt	8080	
Trip before 4	8082	
Trip ANY 2	8083	
Trip ANY 3	8084	
Trip 4 STARS	8085	
Trip Striped Diagonals	8086	
Trip before 5	8087	

Trip Sel before 5	8088
Trip Extra Card	8089
Trip Corner	808A
Trip Rollover	808B
Trip Bonus	808C
Trip Pot enable	808D
Time Stepper	808E
EB Stepper	808F
Selection Stepper	8090
Score RED	8091
Score YELLOW	8092
Score GREEN	8093
Score WHITE	8094
Replay Counter RED	8095
Replay Counter YELLOW	8098
Replay Counter GREEN	809B
Replay Counter WHITE	809E
Trip Pot Main Card	80A1
Trip Pot Extra Card	80A2
Total IN 5 Frs	80A3
Total OUT 5 Frs	80A7
TSTACK	80B4 to 80C9 included = the 22 tilt codes
HOLE SW 1 till 25	812C to 8144
DIPSW A till H	8223 to 822A included
MAGIC MOTOR SW A to E	821B to 821F
TLF CODE A B C D	8220
TROUG SW 0	8158
1	814C
2	814D
3	814E
4	814F
5	8159
6	815A
7	8150 (little O, possible a zero??)
8	815B
9	8152 : Ex Pulslift deleted
GAME	768A
Super Reflex Flag	8077
Super Reflex Correction	8057
Super Reflex Counter	8054-8055-8056
Clear RAM ALL	8012
Mixer 1	8065
Mixer 2	8066

Mixer 3	8067
Mixer 4	8068

THE END