EN

User Manual

SMART CONSOLE

NOTES LEGEND

	The symbol aboard is used inside this publication to indicate an annotation or a suggestion you should pay attention.

⚠	**The symbol aboard is used inside this publication to indicate an action or a characteristic very important as for security. Pay special attention to the annotations pointed out with this symbol.**

Contents

APPROVAL SIGNS

COMPANY FUNCTION	INITIALS	SIGN
PROJECT MANAGER		
TECHNICAL ELECTRONIC MANAGER VISA		
SALES MANAGER VISA		

1 INTRODUCTION

The Smart Console is an handheld tool developed to improve setup and programming of all Zapi products installed in any application.
It features a clean and easy-to-use interface and a bright display which simplifies access to parameters and troubleshooting.
Moreover it is not limited to visualize parameters and alarms, like the standard Zapi Console Ultra, but it has advanced functions like capability to download parameters or CAN messages to a USB memory stick.

This manual will detail all characteristics of the Smart Console.
For new customer willing to test the Smart Console as much quickly as possible a dedicated chapter is available: see Chapter 3 "Quick Start".

2 OVERVIEW

2.1 Features

- 3.2'' TFT LCD with backlight for easy viewing in low light conditions
- Plastic cover to protect against mechanical shocks
- Silicone keyboard resistant to industrial environment
- Key placement to navigate easily through console menu
- Communication through:
  - Current-loop serial line as standard Zapi console
  - CANBUS line
- CAN speed up to 500kpbs
- CAN protocols supported:
  - PC CAN CONSOLE (standard)
  - ZAPI CANOPEN
- It can accommodate different types of connection cables
- Power supply can be sourced by:
  - External Battery or dc-source (for CANbus communication)
  - Internal supply: 4xNiMh or Alkaline batteries placed in the dedicated holder (CANbus or serial line)
- Simple and straightforward user-interface
- TESTER menu can display more fields at once
- Parameter SAVE/RESTORE
- Password to protect parameters from unauthorized modifications
- USB Embedded Host to permit additional functions

2.2 Operational ratings

2.2.1 Electrical

External power supply

Parameter	Value	Comment
Maximum supply voltage on CNX8 (+Batt) supply pin	92V	Continuous
Minimum supply voltage CNX8 (+Batt) supply pin	11V	Internal dc/dc switches off
Supply current	115mA	Supply voltage=28V, console idle and not connected
	200mA	Supply voltage=28V, CAN connected and exchanging data

Internal power supply

Parameter	Value	Comment
Size of battery	AA	
Supported types of battery	NiMh, Akaline	
Maximum supply voltage (Sum of 4 cells)	6.5V	
Threshold voltage for battery discharge warning (Sum of 4 cells)	5V	NiMh cells, console idle and not connected
Running time	4hours	4x1950mAh NiMh batteries, CAN connected and exchanging data, USB stick inserted and supplied
	5h 30'	4x1950mAh NiMh batteries, CAN connected and exchanging data

Current-loop serial line

Parameter	Value	Comment
Maximum output current on CNX4 (NCLTXD)	35mA	built-in 100R resistor
Maximum voltage on CNX4 (NCLTXD)	18V	Output not active
Maximum current sink at CNX5 (PCLTXD)	30mA	built-in 470R resistor
Maximum voltage on CNX3 (NCLRXD)	0.5V	In order to guarantee reception
Absolute maximum voltage on CNX3 (NCLRXD)	96V	

CANBUS line

Parameter	Value	Comment
Absolute voltage range on CNX6 (CANL) and CNX7 (CANH)	-80÷80V	Respect to ground
CNX6 (CANL) output voltage	0÷2V	During communication
CNX7 (CANH) output voltage	3÷5V	During communication
Maximum CAN speed	500kbps	

USB line

Parameter	Value	Comment
USB version	2.0	
USB class	Host	
VBUS supply voltage	5 ±0.2 V	
VBUS supply current	Internally limited	
Supported file system	FAT FAT32	

2.2.2 Environmental

- Keyboards has an anti-scratching treatment.
- IP grade:
  - IP51 (front side)
  - IP20 (all other sides)
- Tested against falling from 1m height, all sides
- Operational temperature: -10°C ÷ 50 °C

2.3 Operational Modes

The Smart Console has been designed to have multiple ways of operation. Three modes can be identified:

➢ Serial connection powered by four standard AA size batteries placed in the battery holder of the console.

➢ CANBUS connection powered by four standard AA size batteries placed in the battery holder of the console.

➢ CANBUS connection with Smart Console supplied by an external dc source. This source may be a standard battery (lead-acid or other type) or a dc/dc converter

2.3.1 Current-loop serial connection (internal supply)

The Smart Console offers the same serial connection as the well-known Console Ultra.
Main characteristics of this operational mode:

- Current-loop serial communication
- Console is connected to a *single* controller only (even if Remote Console option is available)
- Baud-rate selectable
- Smart Console powered by 4 AA batteries instead of being powered by the target controller like the Console Ultra
- USB active to provide additional functions (see chapter 5)
- Zapi can provide the serial cable compatible with Molex SPOX connector used in Console Ultra (see section 4.3.2)

Please refer to section 2.4.2 to check which Zapi products with a serial connection are supported by the Smart Console.

2.3.2 CANBUS connection and internal supply

The Smart Console can connect to an existing CAN line and connect with any

Zapi controller inside this line.
Operation is similar to the PC CAN Console software but it is not needed to have a Personal Computer.
Main characteristics of this operational mode:
- It can be connected to a CAN line composed of any combination of modules, both Zapi ones and not-Zapi ones
- Supported speeds: 125, 250, 500kbps
- It sees the entire CAN line and all CAN modules.
- Smart Console powered by 4 AA batteries
- USB active to provide additional functions (see chapter 5).

2.3.3 CANBUS connection and external supply

Operation is similar to 2.3.2 but supply source is different:
- It can be connected to a CAN line composed of any combination of modules, both Zapi ones and not-Zapi ones
- Supported speeds: 125, 250, 500kbps
- It sees the entire CAN line and all CAN modules.
- Power supply must derive from a dc source. Typical supply sources are:
  - Main battery of the application, like a lead-acid traction battery
  - Output voltage of a dc/dc converter
- Wide supply voltage: nominal battery voltage from 12V to 80V.
- USB active to provide additional functions (see chapter 5).

2.4 Supported products

2.4.1 CAN communication

In general CAN communication is possible to almost every Zapi controller with a standard CAN interface . The few exceptions are listed below.

Different CAN protocol

The Zapi controller may use a CAN protocol which is not accepted by the Smart Console.
In this case the only possibility to overcome this issue is to modify the Smart Console firmware.

To update the Smart Console firmware please refer to section 2.5

Isolated CAN

In some application the CANBUS might be isolated from the main supply source. This means that CANL and CANH signals are referenced to a ground signal (NCAN) and a positive supply voltage (PCAN) which are isolated by the main supply source.
NCAN and PCAN are used to supply the isolated CAN transceivers of each module of the CAN line.

Smart Console **has no isolated CAN transceiver** but it is possible to connect to this type of line in two ways:

- Use internal batteries. In this case connect NCAN to the ground of the console: **don't connect any other ground signal from the application!** CAN communication will run normally
- Connect the console ground to NCAN and the positive supply pin CNX8 to PCAN. If PCAN is within limits of CNX8 supply voltage and if it can deliver enough supply current (see section 2.2.1), the console will turn on and it will operate normally.

CAN speed

The Smart Console supports CAN speed up to 500kbps. Larger speeds are not supported.
If a Smart Console is connected to a CANBUS running at large speed, every communication attempt will return an error message.

2.4.2 Serial communication

The Smart Console retains the same serial communication as the Console Ultra. Because the Console Ultra has been on the market for many years, it is supported by a wide range of products ranging from the very old chopper series to the latest "E" family AC controllers.
The Smart Console has been developed to cover the same range of products so it is expected to be compatible with all controllers which can connect the old console.

Following list contains all product which have been tested successfully with the Smart Console serial interface:
➢ AC2 FLASH
➢ AC3 FLASH (standard and 2µc version)
➢ ACE2 (standard and 2µc version)
➢ ACE5 (standard and 2µc version)
➢ ACX
➢ AC0
➢ AC1
➢ COMBIAC1
➢ DUALAC2
➢ EPS-AC0
➢ SEM0
➢ H0
➢ H2

Moreover the Smart Console is compatible with all latest generation controllers whose serial connector is not reachable unless cover is removed:
➢ COMBIAC0
➢ COMBIACX
➢ ACE3
➢ VCM

⚠ *It is possible to try connecting to a controller not listed above. Serial*

interface has been designed to avoid failures to the target controller circuits. It is always possible that incompatibility towards some controller may arise, causing a systematic "NO COMMUNICATION" error. In majority of cases this will happen in presence of a "custom" serial protocol. Contact Zapi for support.

2.5 Update of SMART Console firmware

The firmware installed in the Smart Console can be modified if needed. There are many reasons behind the need to update the firmware:

- Zapi has delivered a new firmware adding new functions to the Smart Console
- Zapi has delivered a new firmware which removes bugs present in previous versions
- A special firmware has been developed for a specific application/customer

See 4.3.3 too.

⚠ *Firmware update is a procedure which must be carried out under assistance of a Zapi technician.*

⚠ *Please contact Zapi for further information*

3 QUICK START

This chapter is dedicated to new users who wants to get started quickly without entering too much into details.
Since description is minimal, read it carefully and don't skip any paragraph.
For a more detailed description about hardware and the software functions please refer to Chapters 4 and 5.

3.1 How it looks

There are four main parts which must draw attention of new users

3.1.1 The display

A bright 3.2'' TFT LCD display is the core of the console.
Every time it turns on it will display first the Zapi logo and then the HOME SCREEN.
Majority of menus has a simple colour palette with white text on black background.

By itself the display is very fast. While showing information on screen a certain level of latency is always present. This latency is due to the console-controller communication speed and it is not related to the display speed.

End-of-line tests in Zapi have been developed to intercept all display defects before shipping. Anyway, when the display is turned on for the first time, it is strongly suggested to verify that no fixed or burnt pixels are present inside the viewing area.

3.1.2 The keyboard

The keyboard is used to navigate in the different menu. It features some key with special functions and a green led.
Different button functions are shown below.

UP and DOWN keys

In most cases a menu is a list of items: these items are ordered in rows. Selected item is highlighted in light blue .
Up and down keys are used to move the selection up and down: in other words they are used to "scroll".

LEFT and RIGHT keys

Normally used to increase and decrease the value associated with the selected item inside a menu.

OK and ESC keys

OK key is used either to confirm actions or to enter a submenu.
ESC is used either to cancel an action or to exit a menu.

F1, F2, F3 keys

These buttons have a contextual use. The display will say which F button can be used and its function.

ON key

Used while operating with internal batteries. See section 3.2 for further details.

While the Smart Console is powered from external sources on pin CNX8 the button ON is deactivated regardless of the presence of the batteries.

GREEN LED

When the console is powered on and running the green led is on.
Green led can blink in certain cases which will be described better in following sections.

3.1.3 The Main connector

The main connector is placed in the top part of the Smart Console. It is a 15 pin D-subminiature (DA-15) female connector.

The main connector is called CNX in this manual. When referring to a single pin "k", the name CNXk will be used

All communication signals are in this connector
Its pin layout is described in section 4.2.

The CNX connector hosts more signals than what is needed for a typical use. Moreover its D-sub layout is not suitable to be connected to Zapi products. **It is up to the cable the task of picking up the correct signals from the application/controller and direct them to CNX connector**: for example the cable for serial communication takes only six signals from CNX and it directs them to the standard Molex SPOX plug.

3.1.4 The USB connector

Placed in the bottom part of the console, it is a standard type-A socket.
USB functionality is discussed in next chapters.

3.2 Use of internal batteries

Smart Console operates using four AA batteries placed inside the battery holder. **With this power supply, it can communicate either via serial line or CANBUS**.

SUPPORTED BATTERIES

Preferred battery type is rechargeable NiMh. Use a mAh rating as much large as possible to increase battery life.
Alkaline 1.5V batteries are supported too but, before installing them, it is necessary to change parameter BATTERY TYPE: see section 6.1.

⚠️ ***Don't use batteries with leakages! They can damage the electronic board!***

⚠️ ***Don't mix battery types: use four batteries of the same type and with same level of charge.***

⚠️ ***Don't exceed voltage ratings shown in 2.2.1. Larger voltages will damage internal circuits. Smaller voltages will prevent console starting.***

PLACING BATTERIES

1. With Smart Console turned off, open the battery holder by removing its cover. Notice that this operation exposes part of the electronic board: do this operation while in a clean environment!
2. Place the four batteries as indicated by the holder.
3. Close the cover

If the batteries are in place the Smart Console can still operate from external supplies as described in 3.5.
When an external supply is used the internal dc/dc will isolate the AA batteries so that they are not discharged.
Batteries can remain inside the battery holder even if they are not used.

⚠️ ***Remove batteries if they are not going to be used for a lot of time***

CONNECTING CABLE

When supplied by internal batteries, **the Smart Console can use either the serial cable (see 4.3.1) or any available CAN cable (see 4.3.2).**

📝 *The Smart Console ground reference is <u>unrelated</u> to the controller/application ground unless a physical connection is set up.*

📝 *Ground reference shall always be connected or communication will be difficult unless connecting cable is very short and there is no disturbance.*

📝 *It is strongly suggested to tighten the lateral screws of the cable to avoid unexpected disconnections.*

POWER ON THE CONSOLE

The console can be turned on with or without the cable already inserted.
1) Press ON key and keep it pressed. The Smart Console will turn on.
2) Notice that the led is off and it remains off for about three second even if the console is booting. If ON button is released while the led is turned off, the console will turn off too.
3) As soon as the led lights up, release the ON button: the console is now operating correctly. HOME SCREEN has appeared.
4) Jump to related section: either 3.3 or 3.4 for further instructions.

BATTERY LIFE

Battery life depends on many variables so it is difficult to determine an estimated time. In general battery consumption is larger in the following conditions :
• Serial/CAN communication running continuously at high speed;
• USB device connected

When batteries reach a low charge level:
• the display will show a battery icon in the top part of the display (see chapter 7)
• led will start blinking fast
Once battery low is signaled, replace the batteries as soon as possible to avoid sudden switching off.

It is not possible to recharge the batteries while they are placed inside the Smart Console. They must be removed and an external charger must be used.

There is no indications for discharged batteries if the console is not powered by them.

To save battery life there is an option which automatically switches off the console after a certain time of inactivity has elapsed.
This function is activated by parameter MAX IDLE TIME: see section 6.1.

EMERGENCY SUPPLY (CAN connection only)

In case battery charge is low and it is absolutely necessary to avoid the console switching off, there is a possibility to keep the console alive.
If a valid supply source is at hand and:
• Power supply voltage is within CNX8 ratings (see 2.2.1)
• Supply voltage is referenced to console ground
It is possible to connect this power supply to console CNX8: the console will start taking supply from CNX8 and it will disable the internal batteries.
From this point console operation falls in the same case as in section 3.5

POWER OFF THE CONSOLE

To switch off the console press again the ON key and keep it pressed until the led switches off.
At this point the console can be turned off safely: release the ON key to complete shutdown.

3.3 Serial connection (internal AA batteries)

The use of the Smart Console with serial connection is very similar to the use of the Console Ultra.

CONNECT THE CONSOLE

To connect the Smart Console to the target, it is required to have a CNX-to-Molex SPOX cable. This cable must end with a Molex SPOX plug which is exactly the same as in the standard Zapi console Ultra.
Further details about this cable are in section 4.3.1.

1) Verify batteries are in the battery holder
2) Connect the cable
3) Turn on the console by pressing the ON button. This passage can be skipped if desired because the console can be turned on in later passages too.
4) Connect the Molex SPOX plug to target controller.
5) Turn on the controller by closing its key switch,
6) If console wasn't turned on at step 3), turn it on now.

⚠️ *By default the Smart console turns on with CAN interface active. However it detects by itself the presence of the serial cable. The console will disable the submenus which are not usable with the chosen connection mean. So, when connected to serial cable, it won't be possible to access menu about CAN connection.*

HOME SCREEN

After showing the Zapi logo, the HOME SCREEN will appear on the display:

```
          *CONS AFG ZP015*

            RS232 CONSOLE

             CAN CONSOLE

            AUTOSCAN CAN

          CONSOLE UTILITIES

           MENU CONSOLE


                          14:00
```

From top:

- First line tells which firmware version is running <u>inside the console</u>, in this case ZP 0.15
- RS232 Console: enter this menu to start a serial connection as in the Console Ultra

- CAN Console: enter this menu to start a CAN connection
- AUTOSCAN CAN: another way to start a CAN connection
- Console Utilities and Menu Console: ignore them at the moment
- The current hour is shown in the bottom right.

Moreover the green led must be turned on and still.

The "RS232" line is already highlighted so press OK key.
Display prompts a message to inform you that a connection attempt is ongoing.

If serial connection fails a "NO COMMUNICATION" warning will be shown after some second: press ESC key and look for what is preventing the connection.

Please notice the red dot appearing in the top right of the display every time you press a button. It indicates that the console has received the command and it is elaborating the request. If the red dot does not appear when a button is pressed, there is probably a failure inside the keyboard or the console has stalled.

CONNECTED

If connection is successful the display will show an image similar to the next one.

```
VMCM      ZP1.00

48V      0A    500h



NO CAN MSG N. 05
```
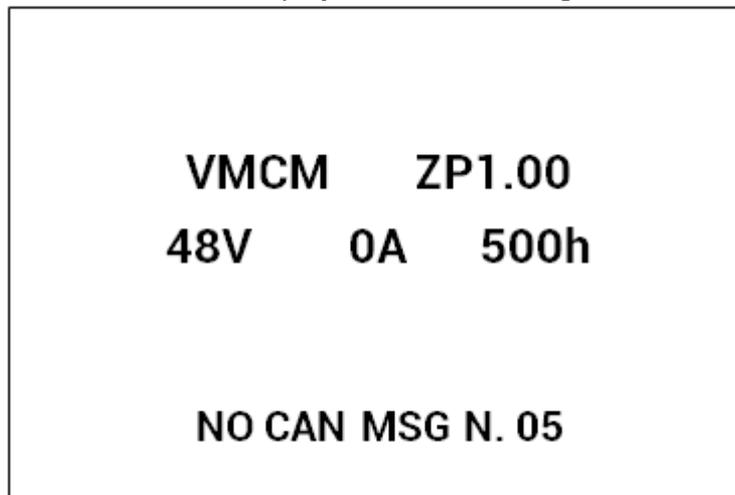
This menu shows basic information about the controller, in a way similar to console Ultra.

- First line tells the controller firmware
- Second line shows controller voltage, controller current and hourmeter
- Last line shows the current alarm code, if present

Press OK to access the MAIN MENU

```
* MAIN MENU *
PARAMETER CHANGE
TESTER
ALARMS
PROGRAM VACC
SAVE PARAMETERS
RESTORE PARAMETERS
SET MODEL
```

MAIN MENU contains the complete list of menus available in the controller.
Contrary to Console Ultra there are no "hidden" menus which must be reached
by pressing many buttons at once: now all menus are visible.
Use UP and DOWN keys to navigate the list: once you find the desired menu
press OK to enter it.

MODIFY A PARAMETER

From MAIN MENU enter the PARAMETER CHANGE menu.

```
PARAMETER CHANGE
ACCELER DELAY          1.0
E. ACCELER. DELAY      1.5
SPEED LIMIT BRK        2.2
E. SPD. LIMIT BRK      2.2
RELEASE BRAKING        4
E. RELEASE BRAKING     2.5
CURVE BRAKING          3
```

With UP and DOWN keys you can scroll the whole list: once you have highlighted
a parameter that you want to modify, use LEFT or RIGHT keys to decrease or
increase the parameter value.

*Keep LEFT/RIGHT button pressed to continuously repeat the value modification
("autorepeat" function): this function will speed up the procedure in case many
parameter values must be changed.*

You can press ESC to exit the menu at any time. In case some parameter has
been modified, the console will prompt a request to confirm/discard changes.

```
                    PARAMETER CHANGE

        ACCELER DELAY                   1.0

        E┌─────────────────────────────┐
         │                             │
        S│        APPLY CHANGES?       │
         │                             │
        E│     YES=OK        NO=ESC    │
         │                             │
        R│                             │
         └─────────────────────────────┘
        E. RELEASE BRAKING              2.5

        CURVE BRAKING                   3
```

Description above is valid for every menu which contains parameters and options like SET OPTIONS, ADJUSTMENTS, HARDWARE SETTINGS, etc.

TESTER

Compared to standard console Ultra, the TESTER menu has been modified deeply. Now it shows four variables at once: use UP/DOWN keys to scroll the list as usual.

```
                        TESTER


        MOTOR VOLTAGE                   0%

        FREQUENCY                       0

        ENCODER                         0

        BATTERY VOLTAGE                 24.5V


                (PRESS F1 FOR GRAPH)
```

It is possible to "block" a variable so that it remains displayed during scrolling. Once the desired variable is highlighted press RIGHT: it will be highlighted in a different colour.

```
                    TESTER

    MOTOR VOLTAGE              0%
    FREQUENCY                  0
    ENCODER                    0
    BATTERY VOLTAGE            24.5V


             (PRESS F1 FOR GRAPH)
```

As soon as you restart scrolling up or down the "blocked" variable will be placed in first line from top: from now it will not move anymore but its current value will be updated continuously as usual. The "blocked" variable will be highlighted in light blue.
Blocking procedure can be repeated up to three time thus three variables can be fixed on screen while the fourth one always scrolls. See example below.

```
                    TESTER

    FREQUENCY                  0
    ENCODER                    0
    ACCELERATOR                0.0
    DIGITAL INPUT #1           OFF   GND


             (PRESS F1 FOR GRAPH)
```

In this way it is possible to keep track of four variables, placed far from one another in the complete list, in a single view.
To "unblock" the last blocked variable, press LEFT button. Pressing LEFT up to three times will unblock all variables
Press ESC to go back to MAIN MENU.

Notice that pressing F1 will activate graphical representation over time of the selected variables

Graphic tester feature isn't fully operative yet: it will be activated in a future firmware.

ALARMS

ALARMS menu has changed from Console Ultra. Display shows all controller alarms at once.

```
                   ALARMS


  NO CAN MESSAGE                10h
  INCORRECT START               2h
  NONE                          0h
  NONE                          0h
  NONE                          0h
            F1 TO CLEAR LOGBOOK
```

Five is the maximum number of alarm codes which is stored inside the controller.

Colours are used to separate recurrent alarm codes from rare events. In order of increasing frequency alarm names can be:
- White: up to 5 occurrences
- Yellow: up to 20,
- Orange: up to 40,
- Red: more than 40.

Use UP/DOWN to select a certain alarm in the list: if OK is pressed, additional information about that alarm will be displayed.

Press F1 to cancel the alarm logbook of the controller: once pressed, the console will ask for confirmation.

PROGRAM VACC
Program VACC menu has been slightly modified compared with old console.
Upon entering this menu the console will show the current programmed values.

```
            PROGRAM VACC
           CURRENT VALUES
        MAX              5.0
        MIN              0.3



        PRESS OK FOR SETUP
```
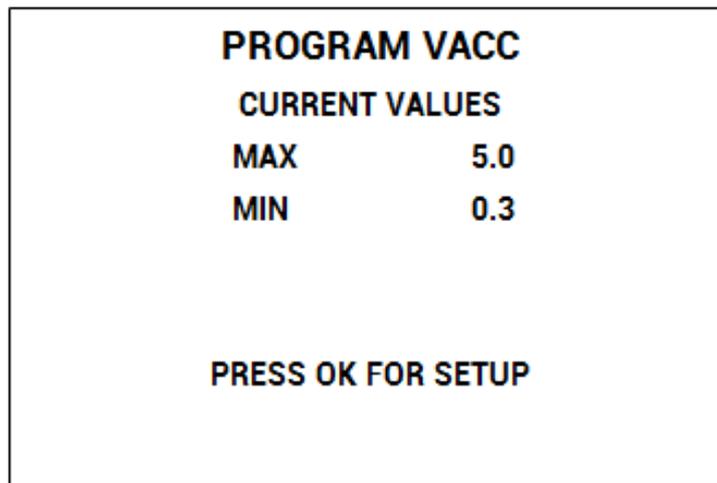
When OK is pressed PROGRAM VACC procedure will start: console will invite you:
- To select the Enable switch, if any
- To select the direction switch (either forward or backward)
- To press the pedal up to its maximum excursion.

Displayed values will vary accordingly to operator inputs.

Sequence above can slightly vary depending on controller firmware. Anyway the logic will remain the same: before programming the min/max values, execute any starting sequence which is necessary, then press the pedal/push the joystick

```
            PROGRAM VACC


        FORWARD          0.0    4.5
        BACKWARD         0.2    4.4


        SEL. ENABLE AND DIRECTION
            THEN PRESS PEDAL
             (ESC TO FINISH)
```
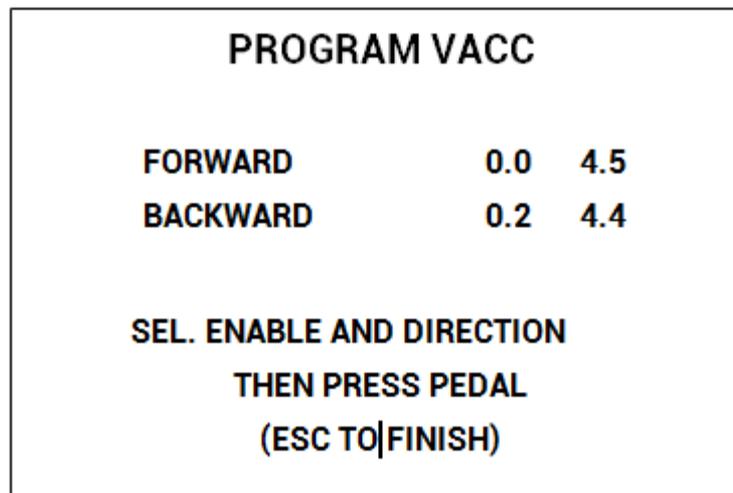
When ESC is pressed, console will ask if programmed values must be saved or discarded.

END CONNECTION
To end connection, just return to the HOME SCREEN: at this point it is possible to remove the cable from the target controller.
If cable is removed while it is inside other menu, the console will return a NO COMMUNICATION alarm.

POWER OFF THE CONSOLE

See section 3.2 for details.

NOTE ABOUT SERIAL HANDSHAKE

Once connected, console and controller carry out an handshake to set serial baudrate. Once it is set, <u>this baudrate is fixed for the controller</u> until it is switched off.

On the contrary the console will reset its baudrate as soon as it is disconnected from the target controller.

Because of this characteristic, it is important to remember:

- If cable is removed, any attempt to reconnect to the previous controller will fail, unless it has been switched off and on again.
- Once connected to a controller, use the SET MODEL menu to connect to other modules instead of physically removing the cable to connect another controller
- If cable is removed, console can be connected to any other module whose serial connection has not been used yet (no handshake occurred before).

3.4 CAN connection (internal AA batteries)

Smart Console is able to connect to Zapi controllers inside a CAN line.
Operation is very similar to the CAN CONSOLE software for PC: any controller will be able to communicate with Smart Console if it can communicate with that PC tool.

Operating via CAN is much different from serial communication:

- Connecting cable is different
- <u>Smart Console connects physically to a CAN line and not to a controller</u>. The console can be connected in any point of the CAN wires: once connected it sees all modules and messages in the CAN line.
- CANBUS is more flexible and it allows special operations which are impossible with serial communication

CONNECTING CABLE

Contrary to serial line, where connector has been a Molex SPOX type since the beginning, <u>CAN has not an established cable</u>.
In general two cases can be distinguished:

- Zapi has developed a cable customized for the customer/application
- Customer has made its own cable.

See section 4.3.2 for more information.

Independently of which case is happening, **a CAN cable shall connect a minimum of three signals** from connector CNX:

- CNX6: it is CANL
- CNX7: it is CANH
- Any ground signal from CNX1, CNX10 or CNX13

The 120Ω termination resistance is not placed by default between CNX6 and CNX7.

In case the smart console must operate from external supply, a forth signal is necessary: a valid power supply must be connected to pin CNX8.
This guide supposes console is running from internal batteries. See 3.5 if an external supply is used.

POWER ON THE CONSOLE

1) Verify batteries are in the battery holder
2) Connect the cable
3) Turn on the console by pressing the ON button. This passage can be skipped if desired because the console can be turned on in later passages too.
4) Connect the Console to the CAN line.
5) Turn on the machine/application controller by closing its key switch,
6) If console wasn't turned on at step 3), turn it on now.

HOME SCREEN

After showing the Zapi logo, the HOME SCREEN will be shown on the display:

```
            *CONS AFG ZP015*

              RS232 CONSOLE

               CAN CONSOLE

              AUTOSCAN CAN

            CONSOLE UTILITIES

              MENU CONSOLE


                                14:00
```
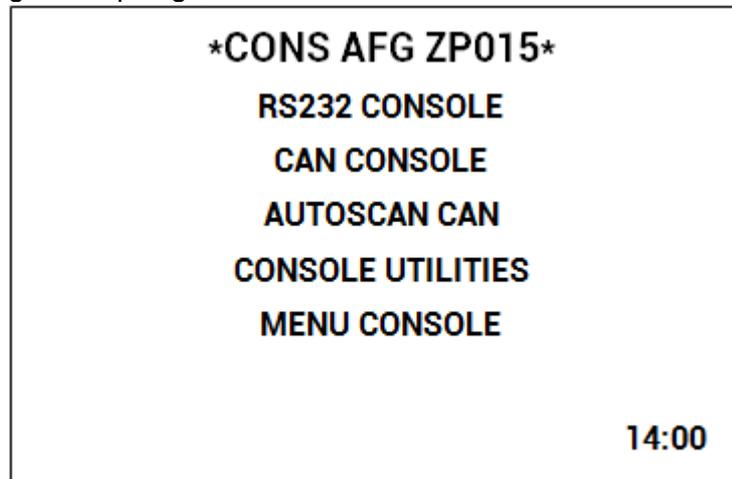
Moreover the green led must be turned on and still.

Notice that CAN connection can be achieved through two ways:
- CAN CONSOLE menu: choose this method if the CAN node number is known
- AUTOSCAN CAN menu: use this method to scan the CAN line and to receive a list of present nodes. When scan is complete it is possible to select the node to connect to.

FIRST CONNECTION METHOD: CAN CONSOLE

Highlight the line CAN CONSOLE and press OK: a new menu will appear.

```
                    CAN CONSOLE
           SELECT NODE           1
           SELECT SUB NODE       0
           SELECT BAUD RATE      250Kb



                 PRESS OK TO START
              (PRESS F3 FOR AUTOSCAN)
```
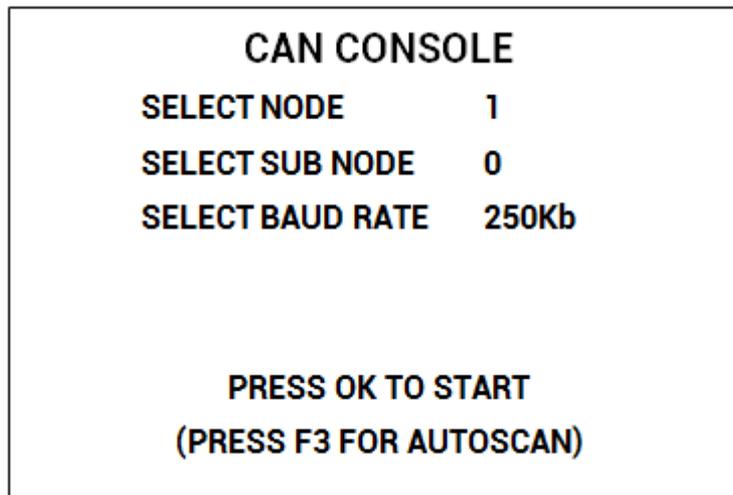
New menu asks for CAN node and subnode to connect to: current values are displayed on the right side. The third line asks for the connection speed.
Use UP/DOWN keys to move between lines and LEFT/RIGHT to change the value of each item.
Once correct values have been set, press OK to attempt communication with that node/subnode.

Press ESC at any time to abort the connection attempt

If connection fails a "NO COMMUNICATION" warning will be shown: press ESC key and look for what is preventing the connection.
Otherwise it is possible to try the AUTOSCAN function: just press F3.

SECOND CONNECTION METHOD: AUTOSCAN CAN

Highlight the line AUTOSCAN CAN and press OK: a new menu will appear.

```
                    AUTOSCAN CAN


           PROTOCOL              STANDARD
           SELECT BAUD RATE      250Kb



                 PRESS OK TO START
             (PRESS F3 FOR CAN CONSOLE)
```
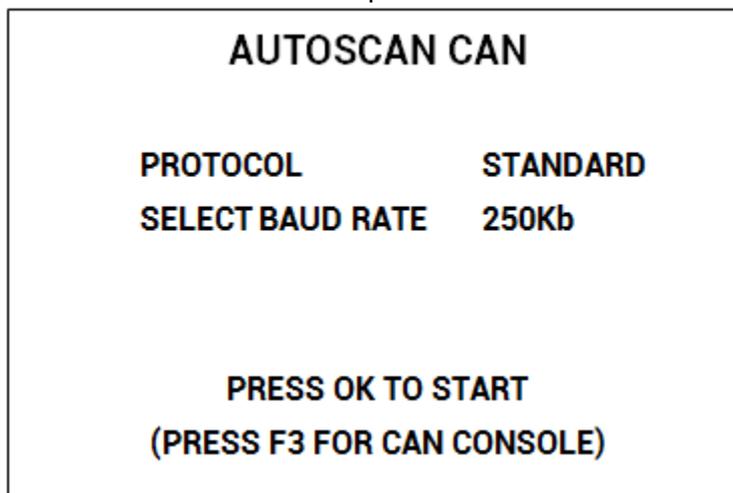
The operator shall choose the type of protocol and the baud rate.
The Autoscan function support two types of protocol:
1. Zapi Standard protocol: mainly found in application where all nodes are Zapi products
2. Zapi CANOPEN protocol: more common when CAN node are both Zapi products and third-party ones.

When OK is pressed the Smart Console will scan the CAN line looking for valid CAN nodes.

Scanning operation is about 5 second long.

After scan is complete, the list of nodes will be shown (if found). Some node will have a "*" symbol close to its name.
The "*" symbol indicates a node to which the console can connect: select the desired node in the list and press OK to connect.
If connection fails a "NO COMMUNICATION" warning will be shown: press ESC key and look for what is preventing the connection

Press ESC at any time to abort the connection attempt

When the protocol is set to "Standard" it is possible that a node takes more than 5 second to show its presence. If some node is missing try to press F1 to refresh the list.

AUTOSCAN function assumes nodes are numbered according to predefined rules. Because CANBUS may have multiple implementations, there is always a possibility to miss some node. In this case the operator must rely on the CANCONSOLE function. Operator must know the node number he is looking for.

CONNECTED

If connection is successful the display will show an image similar to the next one.


```
VMCM    ZP1.00

48V    0A   500h



NO CAN MSG N. 05
```
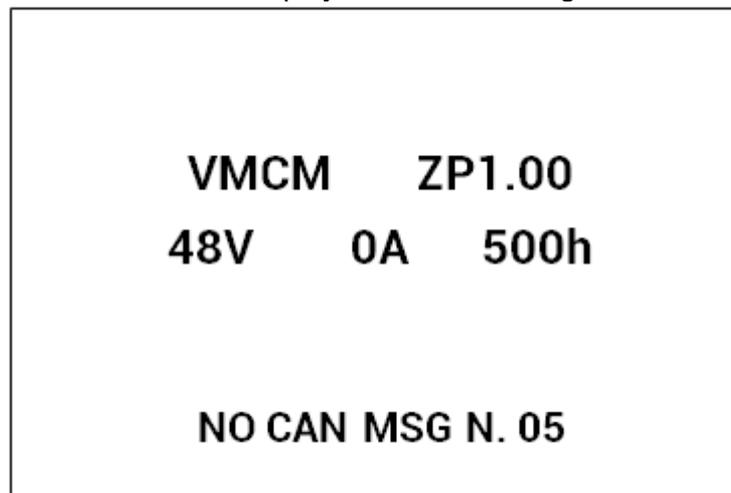
From this point follow the same instructions as in section 3.3.
Basic use of the console via CAN line is equal to the use via serial line. More advanced options are available but they are described in next chapters.

POWER OFF THE CONSOLE

See section 3.2 for details.

3.5 CAN connection (external supply)

When internal batteries are discharged or unavailable, the Smart Console can still operate via external supply, fed on input pin CNX8.
It is also possible to use an external supply to save internal batteries charge: external supply can be fed even if batteries are in place in their holder.

This operating mode is compatible with CAN connection only.

POWER SOURCES

In a battery powered vehicles the traction battery can be used as a source voltage for the console if the limits in 2.2.1 are respected.
If batteries are lead-acid type, the nominal battery voltage will be between 12V and 80V.
Other types of batteries can accepted if their voltage during operation falls within the limits described in 2.2.1. Dc/dc converters are another possible supply source, if their output voltage is within permitted limits too,
With *isolated* dc/dc converters check the ground connection: **ground of the Smart Console shall be the same as the ground of the CAN signals.**

⚠️ *For batteries with nominal voltage larger than 80V, the Smart Console shall be powered by the internal batteries. Don't connect supply voltages outside maximum ratings or console will be damaged!*

POWER ON THE CONSOLE

1) Connect the cable to CNX connector
2) Tighten the lateral screws to avoid unexpected disconnections
3) Connect the Smart Console to the CAN line. Connector can be plugged either before turning on the machine or when the machine is already running.
4) As soon as voltage is available at CNX8 the Smart Console will turn on and HOME SCREEN will appear.

From this point on, console can be used according to section 3.4.

POWER OFF THE CONSOLE
As soon as the cable is removed, console will switch off automatically.

4 HARDWARE LAYOUT

4.1 Cover

Cover is made of polycarbonate and it protects internal electronic from external agents like dust and other types of contaminant
It guarantees some protection against mechanical shocks.
The screen glass is made of transparent polycarbonate and it has the same properties as the cover material.

⚠️ ***Mechanical shocks can create cracks and fissures in the cover. The mechanical shock can propagate inside the product causing cracks in the electronic board and displacement of components.***

⚠️ ***Do not use a console with a damaged cover!***

TOP VIEW (1 : 2)

BOTTOM VIEW (1 : 2)

OBSERVE THE POLARITY OF THE BATTERIES

AA
AA
AA
AA

TO OPEN
PULL THE TAB
IN ARROWS
DIRECTION

REGISTRATION LABEL

USB SOCKET CONNECTOR

100

215

3
33
4.5

SMART CONSOLE
ZAPI

F1
F3
F4
F2

D-SUB 15 POS. CONNECTOR

VARI/MATERIALE/Material type:
VARIOUS

PESO SPEC./Density:

TRATTAMENTO TERMICO/Thermal treatment:

TRATTAMENTO SUPERFICIALE/Surface treatment:

DUREZZA/Hardness:

PESO/Weight:

QUOTE SENZA TOLLERANZA/Dim. without tolerance:
± 1

RUGOSITA'/Roughness:
(UNI-ISO 468/UNI 4600)
Ra 3.2

SPIGOLI/State of edges:
(ISO 13715)
−0.5

SMUSSI/NON QUOTATI/Chamfer not dim.:
From 0.3 to 0.7 x 45°

+0.1

RAGGI NON QUOTATI/Radius not dim.:
From R 0.3 to R 0.7

SFORMI FACCIA GEN./Taper not dim.:
1°

NOTE: PULITO DAI RESIDUI DI LAVORAZIONE
Notes: CLEANED FROM PROCESSING REMNANTS

DIMENS./Dim.:
mm

SCALA/Scale:
0.7 : 1

FORMATO/Size:
A3

COD. PROD./Part number:

DESCRIZIONE/Description:
SMART CONSOLE OUTLINE

ZAPI
POVIGLIO (RE) - ITALY

DATA/Date:
20/05/14

TECNICO/Technician:
A.C.

VISTO/Visa:

PAGINA/Page:
1/1

SERIE/Serie:
IND

DISEGNO N./Drawing n.:
AFGZP7CA

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4.2 CNX Connector

CNX is the main connector of the Smart Console.
The layout is a female DA-15 connector and it belongs to the D-subminature family of connectors for computer and communication system.

DA-15 connector has been chosen because it is widely available on the market. Even if Zapi is always available to design custom cables, the customer is encouraged to create its own cables depending on its need.

The connector has two *threaded nuts which accept screws on the male connector. It is strongly recommended to lock the screws in order to improve electrical connection quality and to avoid undesired disconnections.*

4.2.1 Layout
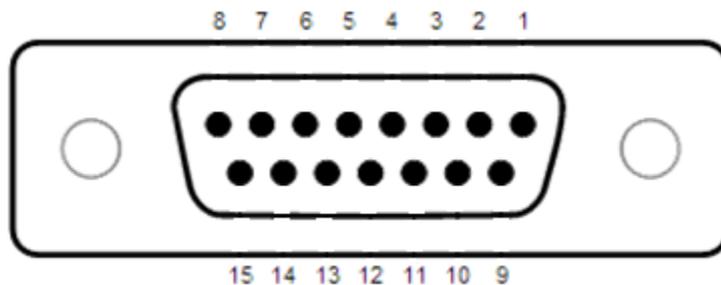
4.2.2 Pin description

PIN	SIGNAL	DESCRIPTION
CNX1	GND	This is the ground of the console. **Ground shall always be connected to the ground of the controller/application.**
CNX2	PRX	Positive of serial reception. It is a signal used in serial communication only.
CNX3	NRX	Negative of serial reception. It is a signal used in serial communication only.
CNX4	NTX	Positive of serial transmission. It is a signal used in serial communication only.
CNX5	PTX	Negative of serial transmission. It is a signal used in serial communication only.
CNX6	CANL	Signal of CANBUS interface. By default no 120Ω resistance is placed between CNX6 and CNX7.

AFGZP0BA – SMART CONSOLE - User Manual

CNX7	CANH	Signal of CANBUS interface. By default no 120Ω resistance is placed between CNX6 and CNX7.
CNX8	+BATT	This is the supply voltage when the console is used for external supply. See 2.2.1 for electrical rating of this pin.
CNX9	BOOT	If turned on with a short between this pin and ground, the console will enter in boot mode. While in boot mode the console firmware can be updated. **In normal operation this pin shall be left open.**
CNX10	GND	Same as CNX1
CNX11	+12V	This is the input of the 12V coming from a controller connected via serial cable. It is not a supply line. However, if this signal is not fed, serial communication will be impossible. Moreover this pin is used to detect the presence of the serial cable.
CNX12	CANT	**The 120Ω termination resistance is not needed normally and it is not placed between CNX6 and CNX7.** If it is necessary to introduce it, make a short circuit between this pin and CNX7.
CNX13	GND	Same as CNX1
CNX14	NC	Do not connect. For future use.
CNX15	NC	Do not connect. For future use.

4.3 Cables

4.3.1 Serial cable

The Smart Console is shipped with a cable for connecting all Zapi products which have the serial line
The connector at the controller-side is the same Molex SPOX type as the old Console Ultra.
Moreover communication signals and protocol are the same as the old console.

MODEL: SMART CONSOLE WITH STANDARD SERIAL CABLE
SPOX CONNECTOR TERMINATION

P/N: FC2360

MOLEX SPOX 8 POS. CONNECTOR
WITH SOCKET CONTACTS
(CONNECT TO THE CONTROLLER)

Pin 1
Pin 8

SMART CONSOLE

+

**STANDARD SERIAL CABLE
(SPOX CONNECTOR TERMINATION)**

Pin 1
Pin 9
Pin 15
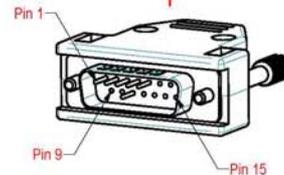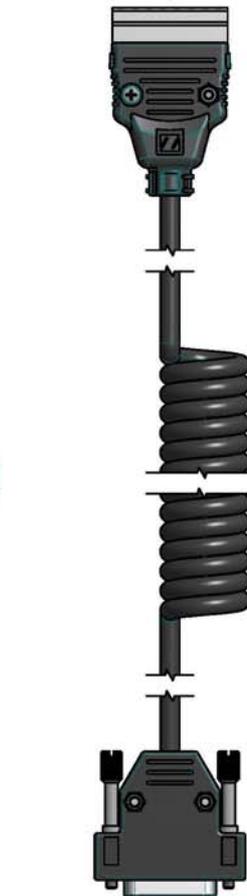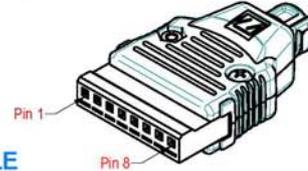
D-SUB 15 POS. CONNECTOR
WITH PIN CONTACTS
(CONNECT TO THE CONSOLE)

4.3.2 CAN cable and connector

There is no specific CAN connector: CAN signals can go through any type of suitable connector.
Each customer must choose the best way to connect the Smart Console to its truck: a dedicated connector, placed somewhere inside the truck, is the best solution.
The customer must place it in an easily-accessible position inside the truck. A bad placement will cause the operator to feel uncomfortable with the console and, sooner or later, it will look for a different connection mean.

Zapi standard CAN cable and connector

Zapi has developed its "suggested" CAN cable based on the Deutsch DT 6pin male connector.
The DT family of connector is well-known for its reliability and it is widely used in industrial trucks.
This CAN cable has been designed with the assumption that power is taken from the truck battery.

TIPO DI MATERIALE/Material type: /			PESO SPEC./Density:	

TRATTAMENTO TERMICO/Thermal treatment: / — TRATTAMENTO SUPERFICIALE/Surface treatment: /

DUREZZA/Hardness: /	PESO/Weight:	QUOTE SENZA TOLLERANZA/Dim. without tolerance: UNI EN 22768/2 - fH	DATA/Date: 13/11/14

RUGOSITA/Roughness: [UNI ISO 468/UNI 4600] Ra 3.2	SPIGOLI/State of edges: [ISO 13715] -0.5 +0.1	SMUSSI NON QUOTATI/Chamfer not dim.: From 0.3 to 0.7 X 45° RAGGI NON QUOTATI/Radius not dim.: From R 0.3 to R 0.7	TECNICO/Technician: A.C. VISTO/Visa:

POVIGLIO (RE) - ITALY

SFORMI FACCIA GEN./Taper not dim.: 1°	NOTE: PULITO DAI RESIDUI DI LAVORAZIONE Notes: CLEANED FROM PROCESSING REMNANTS		PAGINA/Page: 1/1	SERIE/Serie: IND
DIMENS./Dim.: mm	SCALA/Scale: 1:1	FORMATO/Size: A3	COD. PROD./Part number: SEE P/N BELOW	DISEGNO NUM./Drawing n.: AFGZP7FA

DESCRIZIONE/Description:
SMART CONSOLE WITH DEUTSCH DT 6P SERIAL CABLE

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MODEL: SMART CONSOLE WITH DEUTSCH DT 6P CAN CABLE

P/N: FC2399

SMART CONSOLE

+
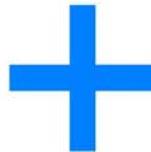
TYCO DEUTSCH DT CONNECTOR
WITH MAIL CONTACTS (GOLD PLATED)
(CONNECT TO THE CONTROLLER)

Pin 6
Pin 1
Pin 4
Pin 3
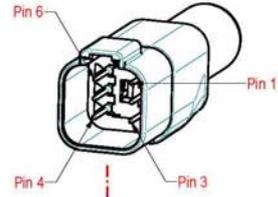
DEUTSCH DT PIN OUT	
PIN	SIGNAL
1	CANH
2	CANL
3	GROUND
4	NC
5	+BATT
6	NC

DEUTSCH DT 6P CAN CABLE

Pin 1
Pin 9
Pin 15
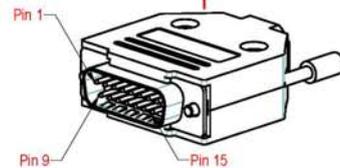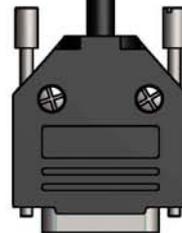
D-SUB 15 POS. CONNECTOR
WITH PIN CONTACTS
(CONNECT TO THE CONSOLE)

Customer-made CAN cable and connector

In section 3.4 customers, willing to create their own cable, will find information about which signals must be routed to CNX.
Refer also to 4.2.2 for further information.
From the point of view of which cable and connector can be used it is not easy to give any suggestion: chosen type can be different from one application to another.
Connector choice must be made according to several possible requirements like:

- Placement of CAN wires inside the truck
- Placement of connector inside the truck
- Preferred mode of operation: with or without internal batteries?
- Size constraints
- Availability
- IP grade
- Durability of connector

And many others.

The cable may be of the "coiled" type since it is easier to handle for the end user.
Straight wire can be used anyhow.
Shielded CAN cables should not be necessary.

Zapi is available to help the customer to find the best connection solution.

4.3.3 Cable for console update

To update the Smart Console firmware the serial cable and an additional interface cable are necessary.
The interface cable is not delivered together with the console but it can be requested to Zapi when needed.

Contact Zapi technicians to receive the cable and the instruction needed to use it.

4.4 Keyboard

Section 3.1.2 has already covered the main features of the keyboard.
Keyboard has been designed to be intuitive to use. In this section some special function will be covered more in detail.

4.4.1 LED

Placed next to the ON button, the green led has multiple functions during operation. This section will describe them all.

Console turned on

A fixed active led indicate the Smart Console is running. In some cases the led can blink (see below).

The led is never off with console turned on and operating correctly. If the

led goes off a failure must have happened.

Turning on/off with internal batteries

When ON key is pressed to power on the console with internal batteries, a software filter prevents the console to stay on unless the key is kept pressed for a certain time.
This feature impedes undesired starting if ON key is pressed accidentally.
When ON is pressed the display will turn on but the led will stay off for some second. If ON is released now the console starting will be aborted.
As soon as the led is lighted, the ON key can be released.

While operating from internal batteries, the ON key shall be pressed to power off the console. If ON is pressed and released too quickly, the console will not shutdown.
Keep the ON button pressed until the led turns off: at this point release the button and the console will power off too.

Internal battery discharged

When internal batteries are at a low charge level, the led will blink quickly.
Moreover a battery icon will appear in the top part of the display.

Replace batteries as soon as possible

There is no indications for discharged batteries if the console is not powered by them.

Display frozen

While carrying out some special function via CAN, the display shows a fixed image. To inform the operator that the console is not stuck, the led blinks slowly.
As soon as the console returns to normal operation, the led will stand still as usual.
See chapter 5 for more information

4.4.2 ON button

The main function of the ON button is to turn on and off the console when internal batteries are used. Other important information to keep in mind:
- Once console has been turned on via ON button, it will not react to other short keystrokes of that button. A software filter prevents undesired shutdown. To power off, press ON button for some second
- ON button can be used to reset the Smart Console in case it is stuck or it does not respond correctly to commands. Keep the button pressed and it will turn off. This method does not work while powered by an external supply source: see 5.6 for an alternative method.
- If console is supplied by pin CNX8, any pressure of the ON button will have no effect

4.4.3 F1 F2 F3 keys

These keys have a use which depends on the menu currently shown.
If a menu permits operation of one F button, it will say explicitly which F button is active and what is its function.
If one or more F buttons are not used, nothing will happen if pressed.
The following list shows the menu where F buttons are used:
- CAN CONSOLE
- AUTOSCAN
- TESTER
- ALARM

The simultaneous activation of F2 and F3 forces a software reset: see section 5.6.

4.5 USB

The bottom side of the console hosts a USB type A socket: only type A plugs are compatible with this socket.
The console features a USB Embedded Host so only USB devices can be connected and recognized by the internal microprocessor.
Moreover the Smart Console supports the "mass storage" device class only: USB sticks and flash drives are the only type of device which can be attached to the console.

If a different USB class device is connected, no damage will occur because the current output of the socket is limited. Anyway the console will not recognize the device and it will do nothing.

4.5.1 USB and console supply source

USB sticks can be connected independently of the supply source: USB interface is active both with internal batteries and external supply.
USB sticks can draw a significant amount of power and, because there are infinite variants on the world market, it is impossible to predict if internal batteries can deliver the needed power.

For this reason:
  A. USB operation is always available when an external supply voltage is used.
  B. USB is deactivated when the internal batteries are close to be fully discharged. The threshold for this deactivation is larger than the threshold of the low battery indication (see 4.4.1)
  C. When batteries are close to the limit defined at point B), there is always a small possibility that the insertion of the USB stick causes a sudden console shutdown.

⚠️ ***To improve use, the USB socket is readily accessible and not protected by covers against dust and other environmental factors: be careful while handling the console and avoid contamination by external agents.***

5 SPECIAL FUNCTIONS

The Smart Console features several special functions which help the operation during:

- Controller installation and setup
- Debug
- Test of different truck configuration

5.1 DOWNLOAD PARAMETER LIST TO USB STICK

When Smart Console is connected to a controller, it has the possibility to download all parameters inside a USB stick.
To use this function, enter the menu SAVE PARAMETER USB in the MAIN MENU.

5.1.1 File format

The complete list of parameters is saved as a *.csv* file in order to be opened with Microsoft Excel® or any other spreadsheet generator tool.
The file is formatted in the same way as if it has been created with the PC CAN Console. Thus it contains the whole list of parameter and, for each parameter, various information is available, in particular:

- Parameter value as it is saved within controller ("Value" column)
- Parameter value as it is shown by console or similar tools ("Scaled Value" column)
- Name of the menu where parameter is placed tools ("Name menu" column)

File name is generated as an hexadecimal code of the time and date of save.
This codification prevents any overwrite of previously saved files.

5.1.2 Download procedure

After entering SAVE PARAMETER TO USB the Smart Console will check the presence of the USB stick. If the stick is not connected yet, it will ask the operator to connect one.
When the stick is present, the display will show the content, starting from the root directory (/) of the filesystem. It should look like the following picture.

```
┌─────────────────────────────────────┐
│         SAVE PARAMETERS USB         │
│   >/                                │
│     VMNCNA11                        │
│     COPY                            │
│     DOCUMENTS                       │
│                                     │
│                                     │
│       OK SAVE     ESC EXIT          │
│     (< PREV DIR , > ENTER DIR)      │
└─────────────────────────────────────┘
```
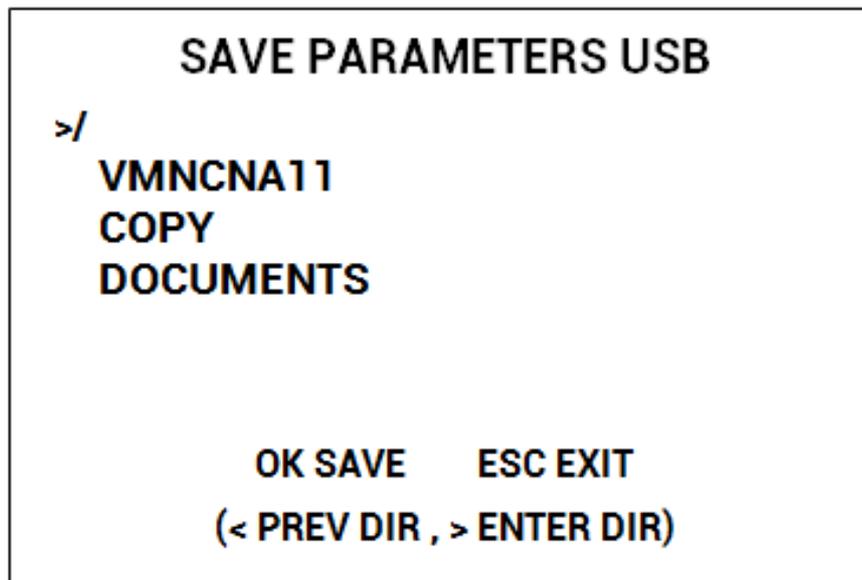
Notice that only directories are shown, not single files.
While exploring the content, the navigation buttons work in the following way:

- Up/down keys are used to control scrolling.
- Right key enters the highlighted directory: its content (directories only) will be shown immediately.
- Left key returns up to one level in the directory structure: it does not work while being in /
- Esc returns to HOME SCREEN
- OK starts download.

When saving files, the console creates a subdirectory whose name has eight digits:

- First four digits are controller type
- Fifth and sixth digits are the customer identification code
- Seventh and eight digits are the code of the software installed inside the controller.

An example of this code is the first directory name (VMNCNA11) shown in the previous figure.
If parameters are downloaded multiple times from the same controller, or from another controller whose eight digit code is the same, all parameter files are saved in the same location.
If the directory does not exist, it is created when download is carried out for the first time.

To download parameters, use following procedure:

1. Navigate the directory list and enter the directory where you want to save the parameters
2. If this directory already contains the subdirectory with the correct 8 digits go to step 3. If it is not present, a new subdirectory will be created automatically. Don't enter the subdirectory
3. Press OK to start parameter download. A progression bar shows the process.
4. When finished, press ESC and display will return to MAIN MENU. USB stick can be removed safely

Connect the USB stick to a PC and enter the directory of point 1). There will be a subdirectory with the correct name and, inside this one, a csv file will be present.

During download the led will blink slowly to indicate the console is still running. When download has finished USB stick can be unplugged safely.

Don't remove USB stick during download or the file will be empty or corrupted!

5.2 DATALOG OF CAN TRAFFIC

The Smart Console can save all CAN messages inside the USB stick. Notice that messages are saved as they are, without any post-processing.
Obviously this function is unavailable when serial line is used.

5.2.1 File format

Messages are saved inside a file with *.txt* extension. The file contains data ordered as columns, separated with semicolons.
Columns contains the following information, all in hexadecimal format:

- A counter (32bit unsigned): it increases every time a CAN message has been read and saved. Each rows must increase the counter by one unit. If two consecutive rows have a larger difference a message has been lost, for some reason.
- Timestamp (32bit unsigned): time, in milliseconds, from the beginning of the data logging.
- Id CAN (32bit unsigned): Id of the received message
- Length (8bit unsigned): length of the message
- Data (64bit unsigned): data field of the message.

Notice that ERROR FRAMES are written.

Each file contains an header showing time and date when datalog started..

File is always saved in the root directory of the USB stick filesystem.
Filename is CANLOGxy.txt where *xy* is an incremental number, going from 00 to 99: overall it can save up to 100 different files. Smart Console will automatically save a new file with an increased number.
Only if all 100 filenames are present in the root directory, new files will overwrite older ones.

This txt file can be imported easily by Microsoft Excel® or similar spreadsheet tool. Please remember to specify the semicolon as separator. Moreover the file should be imported as "text" to avoid undesired pre-processing of the hexadecimal numbers.

⚠️ *Please remember to check the counter column, especially when data-logging at 500kpbs and/or if the CAN traffic is very heavy. No CAN messages should have been lost but, if this happens, contact Zapi technicians to get support*

5.2.2 Download procedure

From HOME SCREEN enter CONSOLE UTILITIES and then CAN DATALOG. The display will show:

```
                CAN DATALOG




     SELECT BAUD RATE      250Kb




     OK TO START           ESC TO EXIT
```
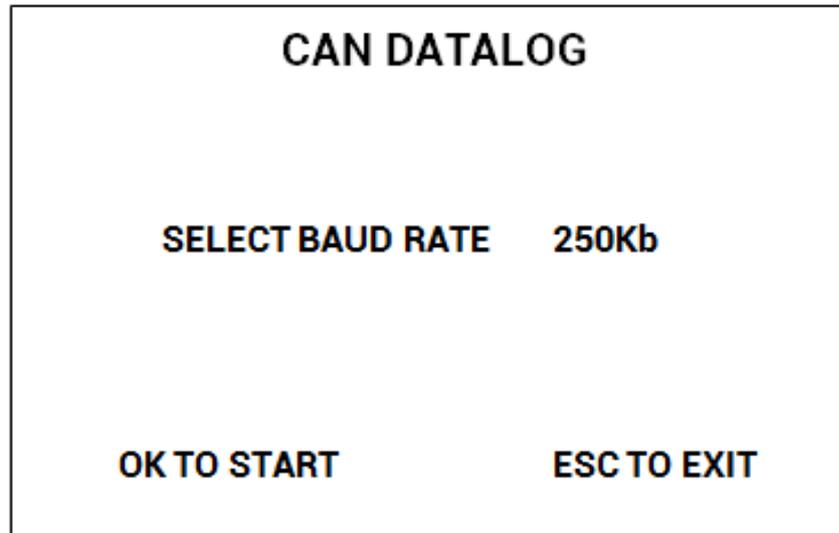
Only baud rate must be specified before starting.
Press OK to start: at this point Smart Console will check the presence of the USB stick.
If it is absent display will ask operator to insert one in the USB socket. As soon as it is plugged, data-logging will start automatically.

At this point, display will show:

```
                CAN DATALOG


     ┌─────────────────────────────────┐
     │        CAN LOG ACTIVE           │
     │                                 │
     │        CANLOGxy.txt             │
     │                                 │
     └─────────────────────────────────┘


     OK TO START           ESC TO EXIT
```
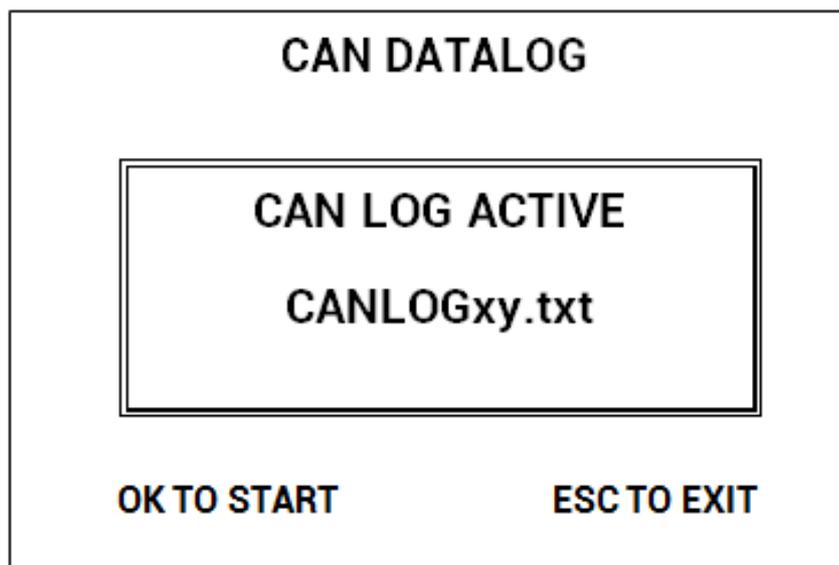
Notice that, instead of "CANLOGxt.txt", the real file name will be shown.
Data-logging will end in the following cases:
- Esc button has been pressed
- Error while reading CAN or CANBUS is ko
- Error while writing on USB or USB stick has been unplugged

⚠️ *After pressing ESC, the console will ask to wait a couple of seconds to finalize data writing inside the flash drive: when this time is elapsed, USB stick can be removed.*

⚠️ *Don't remove USB stick during this time or during datalog process otherwise the output file will be empty or corrupted!*

📝 *During data-logging the led will blink slowly to indicate the console is still running. When data-log has finished USB stick can be unplugged safely.*

5.3 GRAPHICAL TESTER

Coming soon.

5.4 DATALOG OF TESTER VARIABLES

Coming soon.

5.5 PROGRAMMING A CONTROLLER

Coming soon.

5.6 FORCED RESET

In any menu, the simultaneous keystroke of F2 and F3 for 5 seconds will force a console reset and the return to the HOME SCREEN.
Any function, which was underway prior to this reset, is interrupted.
When internal batteries are used, the console will switch off (this method is an alternative to the ON button)
Use this function when console seems stuck or it does not respond properly to commands.

⚠️ *Notice that interrupting any function which was operating with USB will likely cause the corruption of the output file.*

6 MENU CONSOLE

The HOME SCREEN has an additional menu called MENU CONSOLE. This menu contains various parameters and functions which are related to the console only. For this reason, this menu is always accessible independently of communication mode (serial or CAN) and power supply.

MENU CONSOLE has the following appearance

```
* CONSOLE MENU *
CONSOLE PARAMETER
  SET PASSWORD
    READ RAM
  READ EEPROM
  CLEAR EEPROM
    CONFIG RTC
```
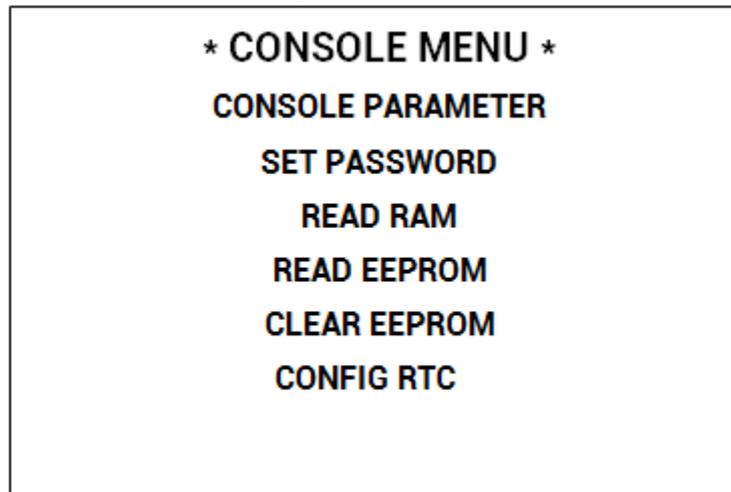
Next sections discuss each function, one by one.

6.1 Console parameter

This menu contains parameters which control console behaviour.

Password enable

See section 6.5 about password use.

Serial baud rate

It defines the preferred speed of the serial connection.
Default value is 9600bps and it should be modified rarely.
Larger speeds will improve reactivity of console when connected to recent Zapi products.
On the contrary older controller may fail the connection handshake or they may exhibit disconnections.

Autorepeat Start and Autorepeat

When a button is kept pushed, its corresponding action will be repeated and accelerated over time.
For example, to increase a parameter from 0 to 100, it is possible to keep pushing the right button while the parameter value is increased quickly.

- Autorepeat Start: decrease this value (in milliseconds) to increase the acceleration effect. It affects only the beginning of the acceleration (button

just pressed) then the following parameter will be used.
- Autorepeat: (in milliseconds) the acceleration effect follows this parameter.

Max idle time

It sets the stand-by time (in minutes) before the console is turned off to save charge of the internal batteries.
The time count is not carried out if the console is supplied by an external source: it works only when internal batteries are used.
To reset the timer it is necessary to push any button.
If the parameter is set to 0 (default value), this function is not active.

Battery type

This parameter sets the type of internal battery installed inside the holder. The value sets the correct threshold for the low-battery indication.
The default value is NiMh because this type of battery is preferred. Otherwise it can be set to Alkaline if non-rechargeable batteries are used.

6.2 Read Ram and Read Eeprom

As for any other Zapi product it is possible to access memory cells inside the RAM or inside the EEPROM of the console.
Select the menu to use depending on which memory cell must be read/written.

⚠️ ***These two menus are mainly used for debugging purposes or other special tests. Use them only after receiving instructions from a Zapi technician.***

6.3 Clear eeprom

Enter this menu to perform the CLEAR EEPROM operation as in any other Zapi product. If EEPROM is cleared all console parameters will be reset to default values except the real-time clock.
Also the records of the SAVE function will be deleted.

Notice that the console will ask confirmation twice before performing this function.

6.4 Config rtc

The Smart Console has an internal real-time clock (RTC) which saves time and date.
The RTC is powered by a separate button cell and it is independent of main power sources of the console.

In this menu the RTC time and date can be set.

Smart Console is already shipped with correct time and date. Factory setting uses CET standard time. It is equivalent to UTC+1 (UTC+2 in summer time)

Button cell should last for many years. If RTC loses its setting, the cell must be replaced. Replacement should be carried out by a Zapi technician

6.5 Password management

Safety regulations ask for protection of critical parameters in electronic modules: a password is a simple yet effective way to prevent undesired modifications from unauthorized operators.
When password management is activated, console will permit read-only operations like
- Looking parameter values
- Looking TESTER variables
- Download parameters to USB stick
- CAN datalog

Any write operation like
- Modify parameter values
- PROGRAM VACC
- SAVE/RESTORE

will be prevented unless the password is inserted

By default password management is de-activated thus any operator can read and modify anything.

Activation

Password management is activated by setting the parameter Password Enable to ON.
Once set to ON, restart the console to complete activation.

How it works

Every time the console turns on, it asks the operator to insert the password or to press ESC.
If correct password is inserted, the HOME SCREEN will appear as usual and there will be no restrictions.

If ESC is pressed, the console will run in READ-ONLY mode. From this point until next restart, no write operation can be carried out.
Nevertheless all menus are still accessible for visualization.

An icon in the top left reminds the operator that read-only mode is active. See chapter 7

Password change

Password is changed in SET PASSWORD submenu.

First of all, the operator shall insert the old password. If correct, the new password will be requested.

Password is 5-digit long and it must be numerical.

Default password is 00000.

Be careful: new password is inserted without hiding digits and it is not requested twice before confirmation.

7 ALARMS AND ICONS

Smart console has few alarms and warnings. This chapter lists them all.
Due to limited display space, these alarms are visualized according to a priority list:

1. Lowest priority: read-only mode
2. Middle priority: battery low indication
3. High priority: Hardware alarms

7.1 READ-ONLY warning

This warning will appear every time the console is started and a password request has been skipped by pressing ESC.
It tells the operator that the console is running in read-only mode and certain operations are not allowed for safety reasons.
The warning appears in the bottom part of the HOME SCREEN.
Moreover a specific icon appears in the top left of the display: the icon remains there in all submenus.

READ-ONLY ICON

7.2 BATTERY LOW warning

This warning tells the operator that internal batteries are discharged and they must be replaced.
This warning has an additional visual indication: when battery is low, the led blinks fast.
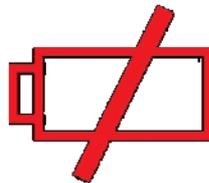
BATTERY LOW ICON

There is no indications for discharged batteries if the console is not powered by them.

7.3 Alarms

These are alarms related to hardware failures. They must catch the operator attention immediately.
All hardware failures share the same icon.

ALARM ICON

Next sub-sections provide a list of hardware alarms.

7.3.1 WATCHDOG alarm

Smart console features an internal watchdog which is able to block any communication in case of microcontroller failure or firmware loop.
It is a safety features which is tested every time the console starts a communication via CAN or serial line.
If test fails, this alarm will appear and no communication is allowed.

Troubleshooting: restart the console. If it happens continuously, contact Zapi for assistance.

7.3.2 EEPROM KO alarm

Smart console has an internal EEPROM for its own parameters and to carry out the SAVE/RESTORE functions.
The content of the EEPROM is checked at each starting to detect data corruption. If test fails, this alarm will appear.

Even if this alarm is present, console can still operate correctly but default settings are used and SAVE/RESTORE function is disabled.

Troubleshooting: restart the console. If it happens continuously, do a CLEAR EEPROM as described in section 6.3. If the problem remains, contact Zapi for assistance.

7.3.3 SUPPLY FAILURE alarm

The Smart Console has an internal diagnosis to detect wrong supply voltages. Once started the console checks if the supply condition falls within one of these cases:

- Voltage of pin CNX8 is too large
- Console is supplied by CNX8 but it detects the serial cable
- Voltage of the internal batteries is too large

If console detects one of the cases above, it will raise the alarm SUPPLY ERROR and it will block any operation.

If the console activates the alarm upon staring from internal batteries, the ON

button will not work normally: when it is released the console will not stay active, in order to avoid damage.

Troubleshooting: **switch off the console immediately!** Check the cable for wrong connections. If internal batteries have been used, check their voltage. If the problem persists, contact Zapi.

8 ACKNOWLEDGMENTS

USB

This products has been developed according to
- USB 2.0 Specifications
- Revision 2.0 of USB-On-The-Go and Embedded Host supplement.

See http://www.usb.org/home for more details.

FONT

This product uses Roboto as a default font.
Roboto is distributed by Google under Apache License.

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See http://developer.android.com/design/style/typography.html

MICROSOFT EXCEL

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9 PERIODIC MAINTENANCE TO BE REPEATED AT TIMES INDICATED

Check the robustness of the cover and of the internal battery holder **every 3 months and after every fall.**

Check the wear and condition of the main connector pins **every 3 months and after every fall.**

Check the console cables: check the wear of the connectors and ensure the insulation is good.
Cables should be checked **every month.**

In case USB socket is used often (once in a day or more) check the functionality of USB connection and functionality, **every 6 months**

Checks should be carried out by qualified personnel and any replacement parts used should be original. Beware of NON ORIGINAL PARTS.
The connection of the console should be made according to the description included in this Manual. Any variations or special requirements should be made after consulting a Zapi Agent. The supplier is not responsible for any problem that arises from wiring methods that differ from information included in this Manual.

During periodic checks, if a technician finds any situation that could cause damage or compromise safety, the matter should be bought to the attention of a Zapi Agent immediately. The Agent will then take the decision regarding operational safety of the console.

NEVER USE A FAULTY CONSOLE .

⚠️ *IMPORTANT NOTE ABOUT WASTE MANAGEMENT:*
This console has both mechanical parts and high-density electronic parts (printed circuit boards and integrated circuits). If not properly handled during waste processing, this material may become a relevant source of pollution. The disposal and recycling of this product has to follow the local laws for these types of waste materials.
Zapi commits itself to update its technology in order to reduce the presence of polluting substances in its product.