EHAD Fuel Equipment

MANUAL

www.ehad.co.za

EHAD FUEL DISPENSERS

General Information

The manufacturer accepts no liability for any consequences resulting from inappropriate, negligent or incorrect installation or adjustment of the optional operating parameters of the equipment's or from the incorrect installation.

The contents of this manual are believed to be correct at the time of printing. In the interests of a commitment to a policy of continuous development and improvement, the manufacturer reserves the right to change the specification of the product or its performance, or the contents of the guide, without notice.

 Software version
The electrical calculator is produced and supplied with the latest software version. Higher versions usually extend functions of the control system.

If there is any doubt, please contact EHAD,

www.ehad.co.za

Safety on Site

Electrical safety - general warning

The voltage used in calculator's basic unit can cause injury that may result even in death. Therefore, it is necessary to follow the relevant safety standards valid for operation with electric equipment, the installation and maintenance of the system must conform to relevant safety regulations. The calculator

must not be subjected to excessive mechanic force.

Environmental limits

Instructions in this manual regarding transport storage installation and use of the calculator must be complied with including the specified environmental limits. The calculator must not be subjected to excessive mechanic force.

Safety of personnel

The power supply must be disconnected before any servicing work is performed. To avoid security hazards or damage of the equipment do not connect the system to power supply until you are fully acquainted with its function.

To avoid electric injury do not remove the outside cover or manipulate with the system under voltage. The system contains capacitors that remain charged even several minutes after power down. Maintenance and service of the system should be carried out by trained personnel only!

Adjusting parameters

Some parameters have a profound effect on the operation of the system. They must not be altered without careful consideration of the impact on the controlled system.

Measures must be taken to prevent unwanted changes due to error or tampering.

1. Basic Data

1.1 General information EHAD I2 series are electronic calculator that control the fuel pump dispensers.

I2 electrical system can control fuel dispensing both one site and two sites, i.e. one I2 motherboard can control both 1 or 2 nozzle at the same time.

The I2 calculator can operate independently and/or can be controlled by a site control system (FMS). The I2 calculator is connected to the site control system via the RS485/CURRENT LOOP lines, which is controlled by its own communication protocol EASY-CALL, and/or according to IFSF standards (communication level LON or TCP/IP-Ethernet).

The main advantages of the I2 calculators that its reliability and its high performance, its low price and its guaranteed quality. The most outstanding features of the calculators are as follows: The high-quality measurement; Integrated Electronic Calibration of meters (EC); Automatic Temperature Compensation of fuel (ATC). Many expanded interfaces (support and connect printer, IC card, ID card, vapor recovery system, site system with RS85/CURRENT LOOP standard, etc.) The I2 calculator controls all functions necessary for dispenser operation and no other electronic devices are needed.

All the above-mentioned features are accomplished at wide temperature range typical for pump stations outdoor operation. The flexibility of the calculator is ensured by possible programming of a wide range of functional parameters (i.e. required by different national standards, different dispenser design parameters, adjustable position of the decimal points etc.)

The I2 calculator enables fuel dispensing in the pre-selection mode, i.e. customer is allowed to preselect the total volume and/or total amount of the fuel required.

1.2 Glossary HARDWARE:

DISP – dispenser side display Motherboard – I2 calculator controls all the dispensing function, authorize all commands for dispensing and transmit data to site control system

*Control board - controls starting up or shut down of solenoid valve and motor by using driving signal
*Keypad – input equipment of the computer device, to realize human-machine conversion

*Keypad display – display the preset value and other related information

*Sensor – convert the angle displacement of the flow meter to electrical purse

*Switch – the device controls startup and shutdown signal of dispenser

*Filter – filter out high frequency clutter waves in power supply circuit

*Transformer – convert strong power (AC) into weak power (AC)

*Nozzle – the terminal unit of hydraulic system of a fuel dispenser

SOFTWARE & OPERATION:

EC – electronic calibration of the meters IFSF (International Forecourt Standardization Forum) – an international standard group of European Oil Societies (keepers of fuel pump stations) defining and publishing technology standards for pump station equipment in order to reach compatibility among devices of various producers.

LON-FTT-10 – communication interface level according to IFSF

RS485 – half-duplex serial communication interface according to ISO 8482 standards

CURRENT LOOP – adopting positive and negative feedback to prompt performance and stability of output current, ensure data transaction transmitted correctly

Site Control System – a system for controlling of pump station operation including technological device control, also call FMS (Fuel Management System)

Online/Offline – communicate with site control system via setting online/offline mode

Master Off value – Set the advanced volume value to shutoff master valve (valid under common protocol mode)

*Valve Off time – Set the advanced time(0-200s) to shutoff master valve(valid under ball valve mode)
*Time Out – after lifting nozzle, while motor start running, the time lasted until stop the motor working when there is non-oil come out

*Transaction time – the time lasted from lifting nozzle until motor startup running

*Start Value – the minimum sales amount for fueling

1.3 The I2 series Calculator Description

The I2 series calculator are an electronic control system based on the powerful single-chip ARM7TDMI-S, the 32 bit central processing unit, which possess 512KB internal flash ROM(Read Only Memory),32KB static SRAM(Static Radom Access Memory), ISP(In-System Programming), IAP(In-Application Programming) function. The system fully controls fuel dispensing on both one and/or two sites. Because of software program requiring large RAM, it expands another 64KB SRAM.

The I2 calculator can be used for the high-speed dispensers. Because it measures the fuel flow of up to 1000L per minute with accuracy less than 0.25%. the calculator has new function for SUPERMAX dispenser. The calculator activates 2 pumps for high speed delivery in this case.

The I2 calculator is a compact device containing power supply, control logic, and the input/output interface. Connectors of the system can be disconnected, which makes the exchange of the calculator during service maintenance possible. The installation and service of the I2 calculator is very simple.

The I2 calculator can be equipped with 2 separate displays on each dispensing site. The side display shows the value of the transactions and other data displayed in various modes of the calculator operation.

The I2 calculator is equipped with the electronic totals according to the IFSF standard. There are non-erasable meter totals and erasable nozzle totals. Electronic totals can be read either via dispenser keypad and/or via the communication line from the site control system. both nozzle totals are allowed to record from the keypad and/or site control system. The internal electronic totals are independent on the electromechanical volume totals. The IFSF (International Forecourt Standards Forum) version of the calculator is equipped with all compulsory totals and other necessary parameters according to the IFSF standard.

The keypad is used to set all of the calculator, the electronic calibration of the meters, setting of the ATC and vapor recovery system control. It also enables the unit prices setting for the manual mode of operation.

1.3.1 **The I2 calculator control inputs and outputs**

*Inputs/outputs defined for the whole calculator (or dispenser)

- Site controller communication interface (RS485/LON/CURRENT LOOP)

- Connect to barcode receipt printer

- Connect to ATG (auto tank gauge)

- Connect to heater for the computer box

***Inputs/outputs defined for the dispensing side**

- Control board input - Display board input - Keypad display input

- IC card reader input

- Receipt printer input

- Speaker input - Temperature detecting input

- Nozzle-up switch input

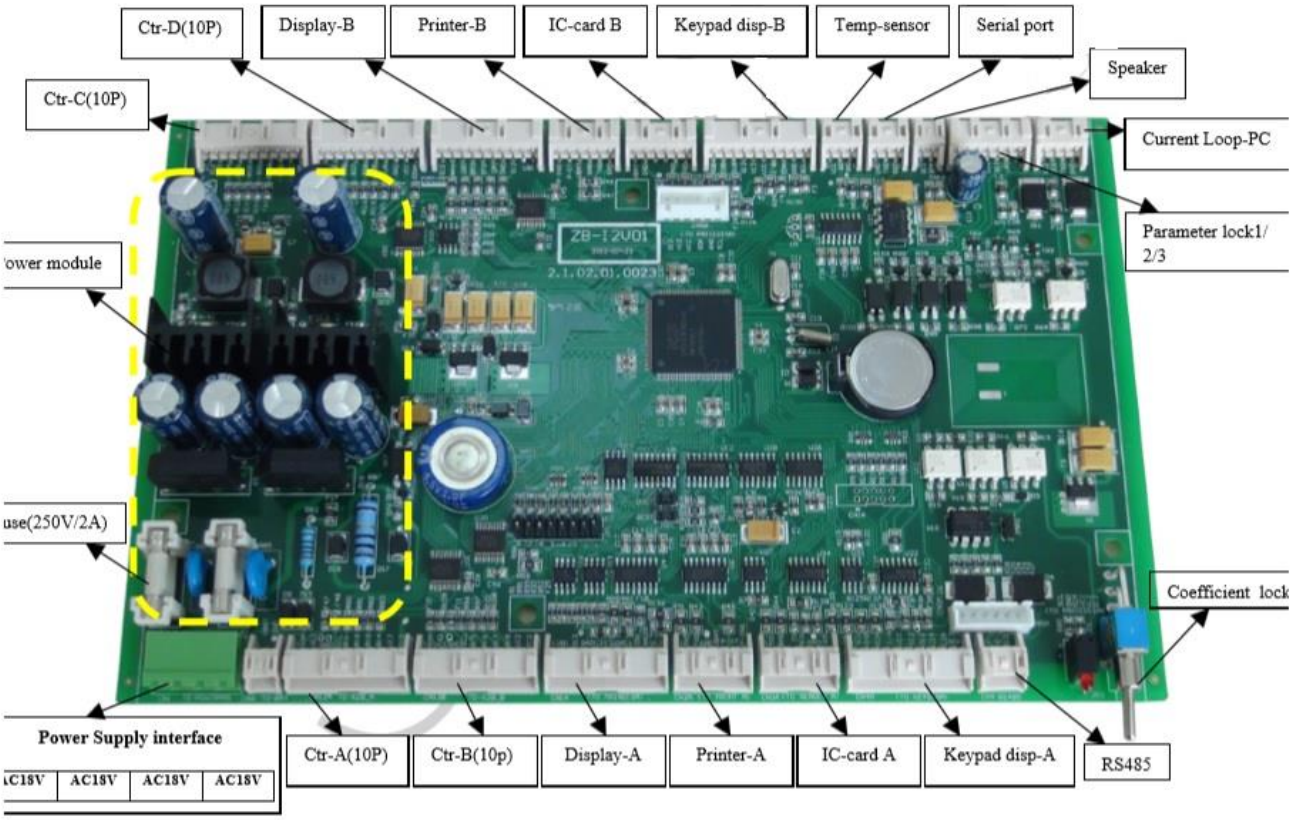
- Pulsar input

- Output signal of motor startup - Output signal of main and secondary solenoid valve

- Power supply input

- LED display input signal

- Indicator signal for sensor/motor/solenoid valve - Electromagnetic totalizer input signal.



I2 calculator power supply

The electrical calculator is equipped with its own power supply that ensures:

* It configures 2 separate power box, one is for strong power (AC220V/380V), the other is for weak power (DC12V);

* Its linear power supply, different components constitute the power system, ensures power supply stable and reliable;

*Supply of control circuits at declared voltage range; *Secure data saving into the memory during power off;

*Supply of power elements;

*Supply of user pre-selection keypads;

*Supply of user side display;

*Supply of side printer;

*Supply of side IC card reader;

*Isolated voltage to interface circuits of the communication line;

*Connection of shielding of all dispenser elements

Note: To secure power supply of the calculator, EHAD manufacturer advises to use the circuit breaker with type C characteristic. ***(Schneider brand is advised)***

RS485/CURRENT LOOP communication line

The calculator is connected to the site controller via optically coupled half-duplex asynchronous serial line, or positive/negative feedback current method to ensure data transition. Physical level of the line follows the RS485/CURRENT LOOP standard.

This type of serial interface enables connection of up to 32 participants without the use of any concentrators or repeaters. The I2 calculator is connected to the RS485/CURRENT LOOP communication line as one physical station. It is equipped with RS485/CURRENT LOOP interface circuits for two-wire/three wire line. Each side of the dispenser represents a logical station to the site controller.

1.3.2 The side Inputs and Outputs

The I2 calculator controls two dispensing sides—A and B. the fuel dispensing can be performed on both sides simultaneously.

Power supply Strong power circuit: motor, solenoid valve, control board, anti-explosion power box in fuel dispenser. Attention:

1. 380VAC three-phase four wire, fuel dispenser using this power supply configured with three phase asynchronous motor;

2. 220 VAC, fuel dispenser using this power configured with single-phase motor;

3. explosion-proof junction box, explosion-proof power box into holes in each line are equipped with silk plugging, pads, they are designed for explosion-proof sealing, while preventing the wire fall off or reverse.

Weak power circuit：The use of power supply for main board works and its interface. Attention：

1. the main board and other integrated circuit use5VDC;

2. the driving parts of the main board use12VDC;

3. microswitch, parameter lock, sensor use12VDC;

filter falls within two-mesh type; it is fit for a variety of impedance matching and may be helpful to tests such as Electrical Fast Transient (EFT), with required voltage 220VAC/50Hz, current 3A.

Transformer:

List of transformer parameters

Input voltage	Output voltage	
Red - red	Yellow –yellow	Green –green
220VAC/50Hz	18VAC	18VAC

For the power supply, EHAD engineer integrated the power board to motherboard. design the high integration circuit, decrease the risk of PCB board burn out. through filtering, transforming, the strong power 220VAC/ 50HZ input into the power board, after rectifying, filtering, stabile volt, the output is DC12V, DC5V. The power board is used in fuel dispenser with IC card connecting the console.

Power failure

When power failure is detected dispensing will stop immediately and transaction data is stored in nonvolatile memory. The last valid values are displayed. The electromagnetic counter shows transaction data for unlimited time after power failure. The LCD displays show the transaction data for the time period minimum of 30 minutes.

When a short-time power failure occurs(the “short time” differs, can be up to 3 seconds)the startup delay after normal power-on does not follow and the display tests immediately, and the customer can set the time value for power failure –power on continue fueling.

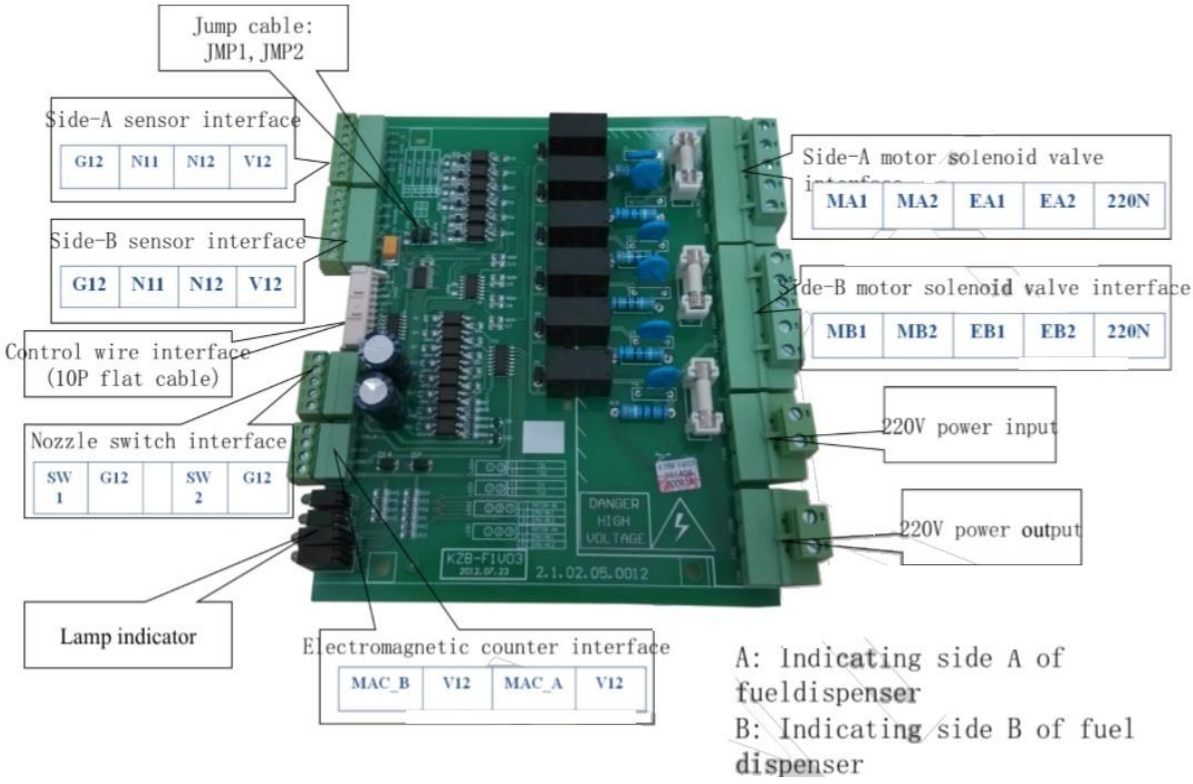
Control board

The control board is used to control the turning on and turning off of the motor and solenoid valve. The main board issues a startup signal and a low voltage signal (12V) for opening the solenoid valve, which are

converted into strong voltage signals to drive the solenoid valve (220VAC) and the motor(380VAC/220VAC), thus completing the function of conversion from weak voltage

power to strong voltage power. The control board circuit isolates high voltage interference signals via photoelectrical isolating components.

In addition to drive motor and solenoid valve in high voltage electrical components outside, the control board still has the function to send startup signal into the motherboard, and also undertake the responsibility of sending electrical purse to motherboard.



Remark:

220V power input: the interface is connecting the power supply cable coming from anti-explosion power box;

220V power output: the interface is connecting the power cable to power filter;

MA1&MA2: Control wires for motor side-A, connect to AC contactor A;

EA1&EA2: EA1 is the main valve wire of solenoid valve,

EA2 is for the secondary valve wire of solenoid valve(side-A);

MB1&MB2: Control wires for motor side-B, connect to AC contactor B;

EB1&EB2: EB1 is the main valve wire of solenoid valve,

EB2 is for the secondary valve wire of solenoid valve(side-B);

SW1&G12: Nozzle 1's switch which startup fuel dispenser for dispensing;

SW2&G12: Nozzle 2's switch which startup fuel dispenser for dispensing;

MAC_A&V12: Nozzle 1's electromagnetic totalizer;

MAC_B&V12: Nozzle 2's electromagnetic totalizer;

Side Displays The side displays show the progress of a delivery. The I2 calculator can use for 2 side displays— one display per side. But it can be add another pinboard to expand two displays per side. In addition, to promote beautiful and harmonious, EHAD specially designed separate displays.

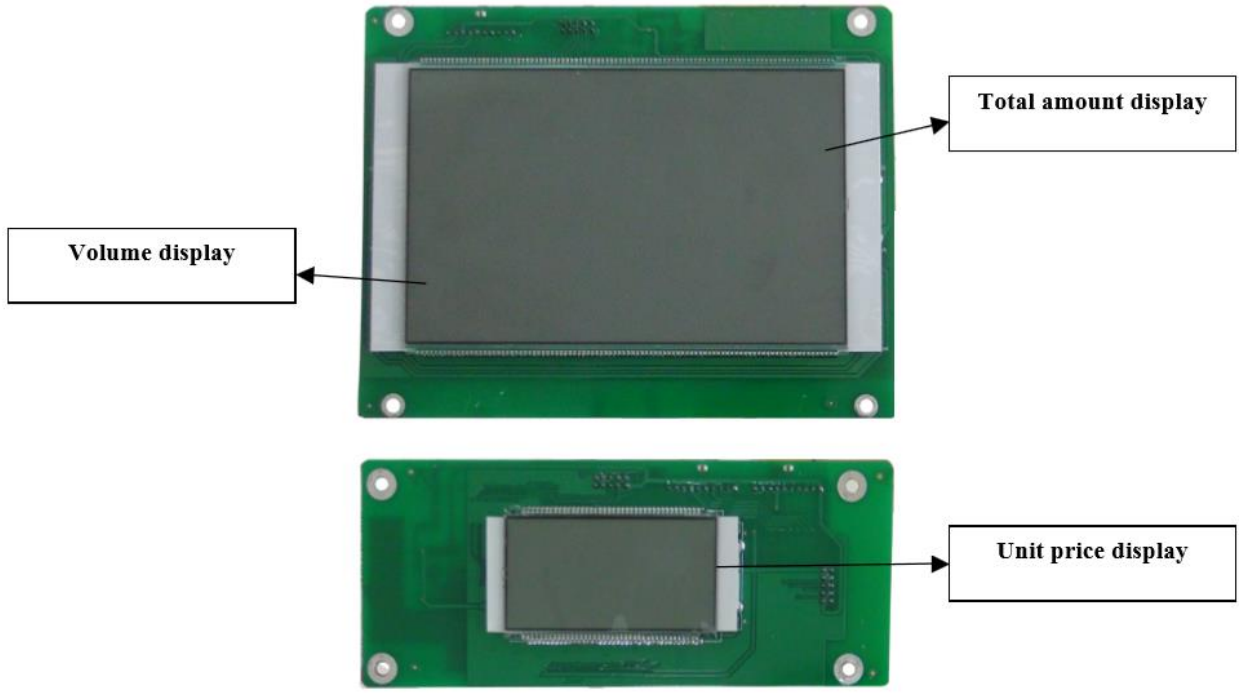
There are two lines on the side displays for the main display, and 1 line for the slave display:

*Total amount (7 digits)

* Volume (6 digits)

*Unit price of the delivered product (5 digits) The size of the digits is 25.4mm in all cases (1 inch).

Note: The number of decimal places (i.e. position of the decimal point) is set separately for all the three displayed values:



LCD displays and unit price displays (DISP LCD/N, DJB/N)

LCD displays are often used mainly because they are cost-effective, the data on an LCD display can be read for at least 30 minutes after power failure. The decimal point is displayed automatically according to parameter settings. DISPLCD/N is produced with the LED backlight.

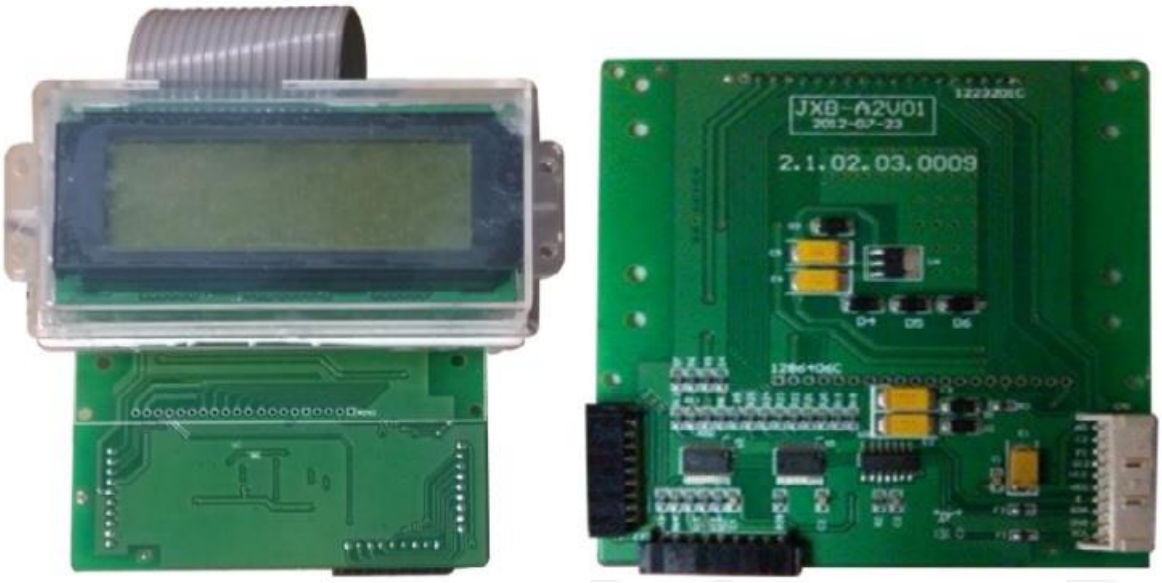
DJB/N displays the unit prices of the fuel. During the transaction the DJB/N displays only the price of the delivered fuel. DJB/N is connected to the 10P connector of the main display.

Unit price

The unit price displayed is the unit price of the currently delivered product and/or product delivered in the last finished transaction of the side. the decimal point settings can be different for unit price/total amount/total volume via keypad operation. The unit price can be adjusted via keypad operation or site control system (FMS).

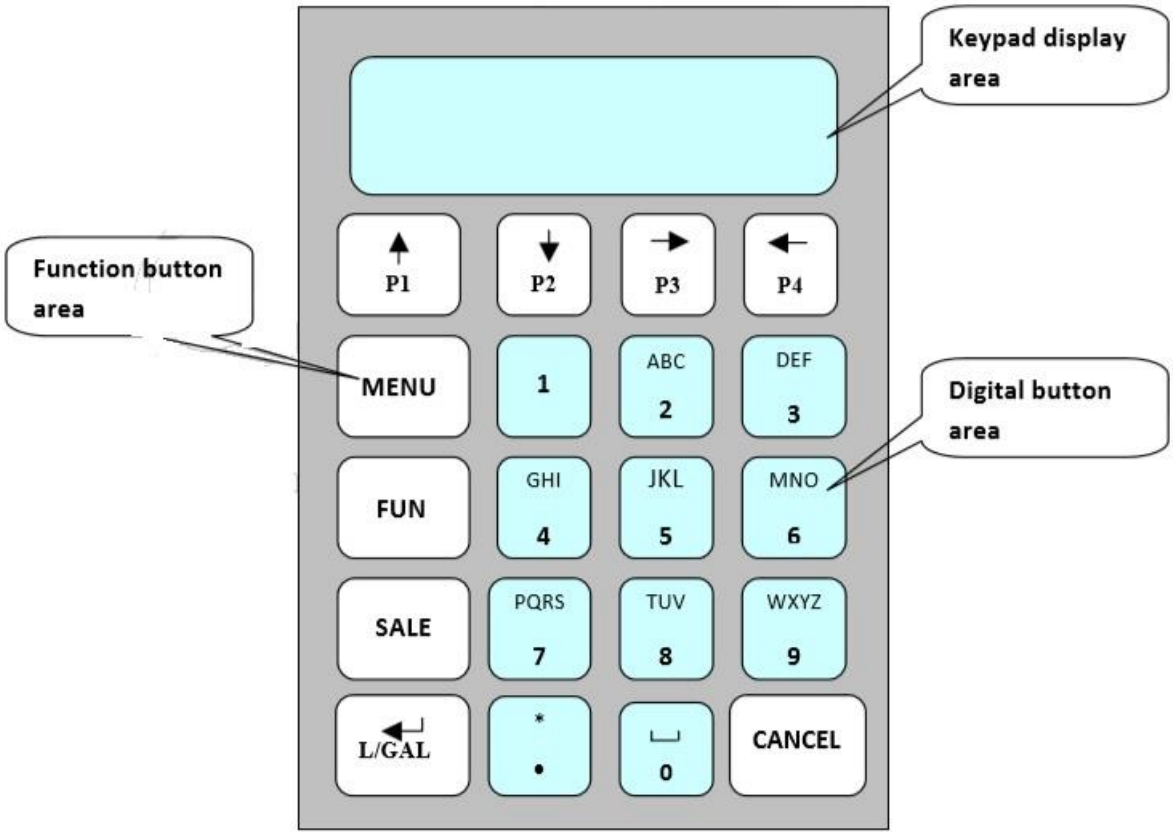
Keypad display

The correct function of the keypad display is essential for the I2 calculator operation therefore any failure of side displays can result in a fatal error causing the stop of a particular fuel delivery and blocking of the calculator. Displays are connected to the calculator via the 10-core flat cable. For the correct function the address of the keypad display must be set by keypad.

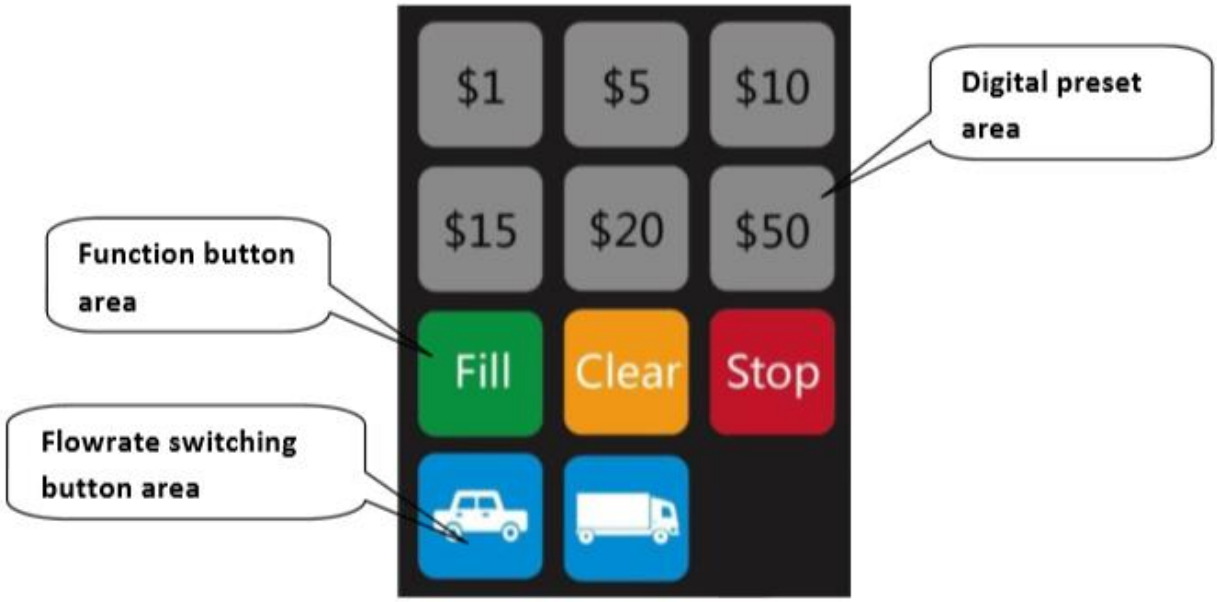


Pre-selection keypad

The user pre-selection keypad can be connected to both dispensing sides. It enables the customer to pre-select the volume and/or total amount of the fuel delivered. Most of the parameters can be adjusted via pre-selection keypad. (1) the regular EHAD keypad (5*4) is as bellow:



(2) the special keypad(4*3) used in Australia is as bellow



Attention: the dispenser which configure with this special keypad must be chosen Australia protocol; The digital preset area, $1, $5, $10, $15, $20, $50: for preset the qualified value refueling;

Function button area:

Fill: clear the previous preset value, enter into non-preset status;

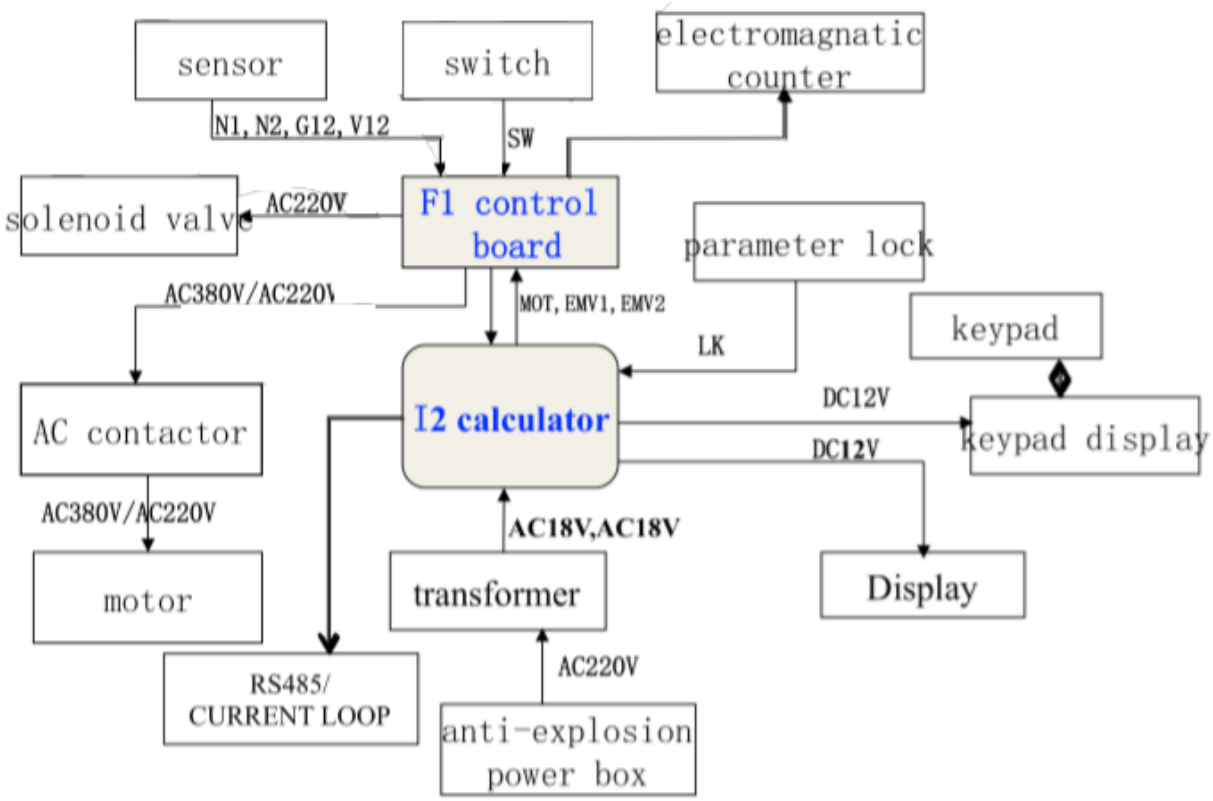
Clear: clear previous inputs, such as: preset value, flowrate chosen;

Stop: whatever preset or non-preset in current status, stop the fueling immediately;

Car: the normal flowrate(50L/Min); choose the flowrate firstly before fueling;(default 50L/Min)

Truck: the heavy-duty flowrate(80L/Min); choose the flowrate firstly before fueling;(default 50L/Min)

1.3.3 Schematic diagram of I2 electrical system



When the user lifts the nozzle, the nozzle switch sends a start signal (SW) to the main board. When the main board receives the SW signal, it issues a reset display command to the display board; the liter and amount displayed on the display board are reset; in the meantime, the main board issues such control signals as to open the solenoid valve and start the motor to the drive board inside the power supply box; then the assistant valve of the solenoid valve is opened, the motor is started, and the fuel dispenser enters into a waiting for fueling condition.

When the user turns on the nozzle, fuel is dispensed into the fuel receiving container via the fuel pump, fuel-gas separator, solenoid valve, flow meter, sight glass, and nozzle etc. When fuel flows through the flow meter, it moves the piston inside the flow meter back and forth to discharge a certain volume of fuel and rotates the output shaft of the flow meter via a series of drive mechanisms. The output shaft drives the rotating of the raster disc (code disc) inside the sensor to cut light beams, so that the sensor board produces counted pulse signals (each of which represents a certain volume of fuel). After the main board receives these counted pulse signals, it rectifies, computes and processes them, and sends the data to the display screen. The main valve of the solenoid valve can be opened for high volume fueling only after the fueling volume of the fuel dispenser is over 0.03 liters.

When the user hangs up the nozzle, the start signal (SW) is interrupted and the main board sends signals to close the solenoid valve and turn off the motor, to the drive board. The main board saves fueling data while the display screen keeps the displayed fueling data unchanged. Now the process of fueling is completed.

The previous process of fueling is not preset fueling. If preset fueling is needed, the user should input the preset quantity of fuel to be filled (measured by liter or sale) into the main board by using the keypad; when the quantity of fuel filled is close to the preset value (reaches the oil output value to close the main valve). the main board sends a signal to close the main valve of the solenoid valve to the drive board; when the quantity of fuel filled reaches the preset value, the main board sends signals to close the assistant valve and turn off the motor to the drive board; the main board saves fueling data while the display screen keeps the displayed fueling data unchanged. Now the process of preset fueling is completed.

1.4 Housing

The I2 calculator is enclosed in a metal (aluminum casting) case with solid connectors for connecting all parts of the dispenser. Also, the control board and power supply parts should be enclosed in its own case to prevent accident caused by high voltage or any other unexpended factors.

Connection of all dispenser parts as well as connection of display/keypad can be done without disassembling the case.

The transparent colored DISP LCN/N displays are delivered without case and must be installed in a position securing effective back-lighting.

2. I2 series calculator settings

2.1 Hardware setting

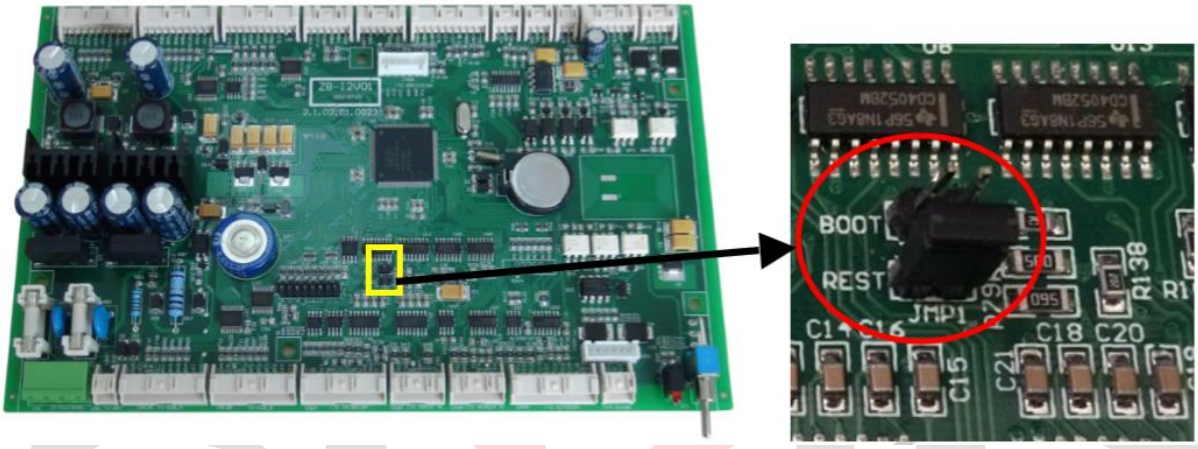
Regarding the I2 series calculator, hardware settings are important and necessary, due to different configuration, different software program, different communication methods, hardware setting is essential to meet the demands of customized requirement.

2.1.1 JP1 setting

JP1 locate in the I2 calculator, see the photo as above, with 8 pins, it can define different configurations. The qualified definition is as follows:

Function requirement		JUMPER No	ON/OFF
Keypad switching mode	Regular keypad(5*4)	1	OFF
	Special keypad(4*3)	1	ON
Flowrate switching mode	80-80L/Min,50-50L/Min	2	OFF
	80 to 50 L/Min	2	ON
Reserved	NULL	3	NULL
Reserved	NULL	4	NULL
Nozzle No. for each side (Side A&B)	1 nozzle	5	OFF
		6	OFF
	2 nozzles	5	ON
		6	OFF
	3 nozzles	5	OFF
		6	ON
	4 nozzles	5	ON
		6	ON
Reserved	NULL	7	NULL
Share printer for both side A&B	Not share	8	OFF
	Share	8	ON

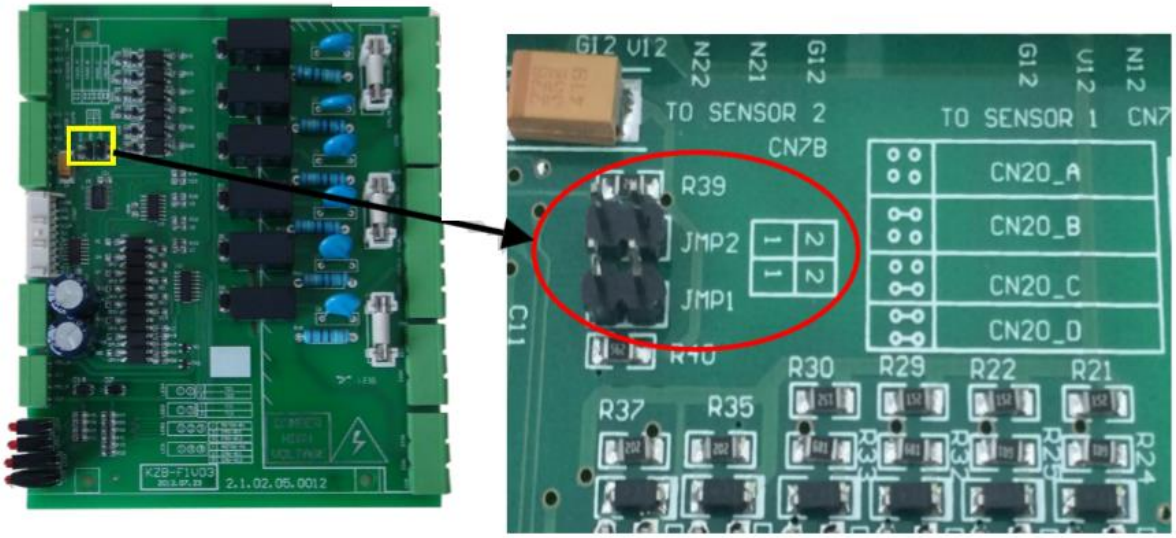
JP1 : open circuit(OFF): non-contact short circuited; short circuit(ON): contact the short circuited. Regarding the flowrate switching, it refers to the double solenoid valves but single oil pipeline model dispenser, and the precondition is: the dispenser configures with EHAD's regular keypad, with parameter lock 3 short circuit, then the customer can operate and convert the flowrate mode freely.



The Reset/Boot pins locate in the middle-lower part of I2 calculator.

RESET mode: Normally, we use a short circuiter to put on the RESET pin, to avoid software program crash caused by electrical interference, EHAD adopt the watchdog circuit. it will restart the CPU automatically if the watchdog is not fed during 1.7s, the watchdog signal(3V~0.8V) gradually damps in the ms level. BOOT mode: Normally, the BOOT pin will be in an OPEN circuit mode, it will be short circuit only when need upgrading software program. Under the BOOT mode, it will enter a guidance mode, which will guide the customer to open the serial programming mode, then the operator can upgrade new software program via the serial port CN12.

2.1.3 JMP1/JMP2 setting



Due to EHAD adopting ARM central processing unit LPC2378, with strong and powerful CPU, one I2 motherboard can configure maximum 4 control boards, 8 nozzles. In order to define the sequence No of control boards, it's necessary to regulate the related Nos via hardware settings.

For the I2 calculator, EHAD regulate related interfaces as bellow:

CN12A-Control board No 1; (nozzle No 1&2)

CN12B-Control board No 2; (nozzle No 3&4)

CN12C-Control board No 3; (nozzle No 5&6)

CN12D-Control board No 4; (nozzle No 7&8)

Ctr-board sequence No	PIN BOARD	Status(ON/OFF)
CN12A(Ctr-board No 1—Nozzle 1&2)	JMP1	OFF
	JMP2	OFF
CN12B(Ctr-board No 2—Nozzle 3&4)	JMP1	ON
	JMP2	OFF
CN12C(Ctr-board No 3—Nozzle 5&6)	JMP1	OFF
	JMP2	ON
CN12D(Ctr-board No 4—Nozzle 7&8)	JMP1	ON
	JMP2	ON

Attention: OFF — OPEN circuit, ON — SHORT circuit;

2.2 Software function enquiry and setting EHAD has a strong and experienced R&D team, over 20 years of industry experience, familiar with users and the industry needs. they can design and promote software program according to customized requirement timely.

The EHAD's non-IC card software program are devided into 3 level interfaces. Different level defines different parameter menu ranks.

All of the 3 level's interfaces are friendly, and gradation distinct, every level need password to be entered, the default password is: 9876; the user can set and recover the password in level 3;

2.2.1 Modes setup The I2 calculator can operate in two modes: Offline mode: Dispensing is controlled via the keypad inputs. Online mode: Dispensing is fully controlled or monitored by site controller via the communication line(the RS485 or the current loop version)

The interface to the FMS is made through a serial channel (balanced current loop with galvanic isolation). Optionally a RS485 interface is possible.

Current operation mode of the I2 calculator does not change even after power-off. To change the mode set parameter level 2, item 2.

Note: Modification of parameter Online/Offline mode via the communication line is possible only from the OFFLINE into the ONLINE mode.

2.2.2 Protocol chosen In order to meet the demands of customer's local requirement, especially for the connection of site

Controller (FMS) used in mainstream, EHAD R&D team specialized design and develop to connect several protocol and FMS.

For the regular non-IC card software program, the protocol can be communicated are concluded as bellow:

No.	PROTOCOL	DESCRIPTION
1	Comm	common protocol, current loop or RS485, can fuel and operate independently or connect to SANKI's or ITL's FMS
2	Russia664	RS485, can connect to Russia's FMS which show 664 for total amount digit/volume digit/price digit
3	Russia765	RS485, can connect to Russia's FMS which show 765 for total amount digit/volume digit/price digit
4	AZT2.0	can connect to Russia's FMS which show 765 for total amount digit/volume digit/price digit
5	Australia	RS485, can connect to Gilbarco's FMS via RS485 for Australia market specially
6	General	Current loop or RS485, specially used in Thailand market, can connect to SANKI's FMS, ITL's FMS, and local FMS of Thailand

2.2.3 Normal function enquiry and settings Volume Tot enquiry (Level 1, item 1) The calculator is equipped with the electronic totals according to related international standard. There are non-erasable meter totals and erasable nozzle totals. Electronic totals can be read either via keypad and/or the communication line from the site controller.

Total volume is displayed on side displays on both total Sale and Liter lines: n Both side displays show the same value; n The first 2 character displayed from the left on the amount display is: "LL--" when the volume totals is displayed; n The rest displaying digits show the volume totals;

Setting: --make the nozzle/keypad under idle mode; --press "PRICE" button, input default password: 9876; --Press "L/GAL" key to enter level 1; --Press "11" or down-arrow button, press "L/GAL" key, then enter into volume totals interface; --Press "L/GAL" key, it reminds to choose a certain nozzle No; --Press "L/GAL" key after choose some certain nozzle No(e.g. 1 or 2…) --The current volume totals will show on both displays and keypad display; --Press "CANCEL" key to return to idle status.

Sales Tot enquiry (Level 1, item 2) Sales totals is displayed on side displays on both total Sale and Liter lines: n Both side displays show the same value; n The first 2 character displayed from the left on the amount display is: “PP--” when the sales

totals is displayed; n

*The rest displaying digits show the sales totals;

Setting: --make the nozzle/keypad under idle mode; --press “PRICE” button, input default password: 9876; --Press “L/GAL” key to enter level 1; --Press “12” or down-arrow button to find: Query tot sales; press “L/GAL” key, then enter into sale totals interface; --Press “L/GAL” key, it reminds to choose a certain nozzle No; --Press “L/GAL” key after choose some certain nozzle No(e.g. 1 or 2…) --The current sale totals will show on both displays and keypad display; --Press “CANCEL” key to return to idle status.

Date &Time (Level 1, item 5) Whatever the fuel dispenser connects to site controller or not, after setting Date & Time, it will indicate the current fueling status and show the local time.

In addition, setting the date & time can also well mange the final customers for overseas agency. because this item is related to the working days for credit customers.

Setting: --make the nozzle/keypad under idle mode; --press “PRICE” button, input default password: 9876; --Press “L/GAL” key to enter level 1; --Press “15” or down-arrow button to find item 15: Date & Time; --Press “L/GAL” key, then enter into Date & Time interface; --Input 15 digits for date and time contents(year(4 digits), month(2 digits), day(2 digits), hour(2 digits), minute(2 digits),second(2 digits), weekday(1 digit)); --Press “L/GAL” key to adapt new setting to the system; --Press “CANCEL” key to return to idle status. e.g: Preset Date & Time as 201605021123371; Explanation: 2016—year; 05—month; 02—day; 11—hour; 23—minute; 37—second; 1— weekday;(Mon-1; Tue-2; Wed-3; Thu-4; Fri-5; Sat-6; Sun-0)

Price setting (Level 2, item 4) Unit price setting can be validated under both Offline/Online mode. Attention: in Online mode, while operate pre-selection, the price may rely on the site controller, some types site controller sends commands including inner set price, but some others will not include it’s own inner price. The price from the dispenser will adjust itself according to related site controller automatically.

Conditions required to enter the price setting: -the nozzle-up has not been performed since last power on of the I2 calculator;

-there are no pending transaction.

Setting: --make the nozzle/keypad under idle mode; --press “PRICE” button, input default password: 9876; --Press “L/GAL” key to enter level 1; --Press “19” or up-arrow button, press “L/GAL” key, then enter into Level 2; --Press “24” or down-arrow button, until find the item 24: price; --Press “L/GAL” key, it reminds to choose a certain nozzle No; --Press “L/GAL” key after choose some certain nozzle No(e.g. 1 or 2…) --Input new price; --Press “L/GAL” key to adapt new price to the system; --Press “CANCEL” key to return to idle status. Master OFF valve (Level 2, item 7) Hereby “X” is assumed to be the master off value. at a high flow rate, both the primary and secondary valves of solenoid valve are opened; when the quantity of fuel is added to the lead for closing the primary valve (approximately (X/100+0.3)L), the primary valve of solenoid valve is closed, the fuel dispenser reduces the output flow rate, the flow speed decreases; when the fuel dispenser continues to fuel to the quantified value at a low flow rate, the secondary valve of the solenoid valve is closed, thus solving the problem of overshoot before the fuel dispenser stops, and enhancing the accuracy of quantified fueling.

e.g: if we assume X=20, it means (X/100 +0.3)L=(20/100 +0.3)L=0.5L; if we preset 10L, while fueling over 9.5L, the primary valve will shut-off automatically, only left the secondary valve open and fueling the last 0.5L to the end.

Setting: --make the nozzle/keypad under idle mode; --press “PRICE” button, input default password: 9876; --Press “L/GAL” key to enter level 1; --Press “19” or up-arrow button, press “L/GAL” key, then enter into Level 2; --Press “27” or down-arrow button, until find the item 27: Master OFF valve; --Press “L/GAL” key, it shows the previous existed value; --Input new “X” value(0-99); --Press “L/GAL” key to adapt new value to the system; --Press “CANCEL” key to return to idle status.

Sale point (Level 3, item 10) Decimal places of sale display; Setting: --make the nozzle/keypad under idle mode; --press “PRICE” button, input default password: 9876; --Press “L/GAL” key to enter level 1;

--Press “19” or up-arrow button, press “L/GAL” key, then enter into Level 2; --Press “227” or up-arrow button, find the item: Enter level 3; --Turn on the parameter lock 90°clockwise, it remind to input password; --Input default password: 9876; --Press “L/GAL” key, it will enter into Level 3; --Press “310” or up and down arrow to find item 310: Sale point; --Press “L/GAL” key to enter into the sale point interface; --Input new sale decimal places(0-3); --Press “L/GAL” key to adapt new value to the system; --Return the parameter lock 90°anti-clockwise ,Press “CANCEL” key to return to idle status.

Liter point (Level 3, item 11) Decimal places of liter display; Setting: --make the nozzle/keypad under idle mode; --press “PRICE” button, input default password: 9876; --Press “L/GAL” key to enter level 1; --Press “19” or up-arrow button, press “L/GAL” key, then enter into Level 2; --Press “227” or up-arrow button, find the item: Enter level 3; --Turn on the parameter lock 90°clockwise, it remind to input password; --Input default password: 9876; --Press “L/GAL” key, it will enter into Level 3; --Press “311” or up and down arrow to find item 311: Volume point; --Press “L/GAL” key to enter into the liter point interface; --Input new liter decimal places(0-3); --Press “L/GAL” key to adapt new value to the system; --Return the parameter lock 90°anti-clockwise ,Press “CANCEL” key to return to idle status.

Price point (Level 3, item 12) Decimal places of price display Setting: --make the nozzle/keypad under idle mode; --press “PRICE” button, input default password: 9876; --Press “L/GAL” key to enter level 1; --Press “19” or up-arrow button, press “L/GAL” key, then enter into Level 2; --Press “227” or up-arrow button, find the item: Enter level 3; --Turn on the parameter lock 90°clockwise, it remind to input password; --Input default password: 9876; --Press “L/GAL” key, it will enter into Level 3; --Press “312” or up and down arrow to find item 312: Price point; --Press “L/GAL” key to enter into the price point interface; --Input new price decimal places(0-3); --Press “L/GAL” key to adapt new value to the system;

--Return the parameter lock 90°anti-clockwise ,Press “CANCEL” key to return to idle status.

2.2.4 The list of I2 calculator parameter settings The parameter of software program’s enquiry and settings is regulated to 3 levels. Different level needs different permission;

Once power on, the dispenser will locate in the idle status, normally, EHAD company already set the related parameter completely before delivery, hereby will introduce the operation for fueling and setting parameters.

From the keypad, we can see the layout of 5*4 buttons, with mental materials. On top line, it’s “P1”, “P2”, “P3”, “P4”, these buttons are used for preset a certain value which customer fuels frequently;

e.g. P1=10USD, P2=20USD, P3=50USD, P4=100USD; If we want to preset 20USD for fueling, Only need to press “P2” will finish the preset operation.

Besides preset total amount, the “P1”, “P2”, “P3”, “P4” with up/down/right/left arrows also undertake the responsibility of setting parameters.

The first column is function buttons area, most of them are used for setting/enquiry or switch parameters/modes.

The other digit buttons are used to input number or letter for fueling or setting related contents.

Regarding the 3 level software operating interfaces, every interface need to verify password to get through, because of different parameter need different safety grade, the access permission of the 3 level escalates level by level. The implication of the level's content is: the first number is level grade, the next number is the sequence No of the item; e.g. item 212: it means the item locate in level 2, and item No 12, the content is: Protocol;

Under level 1,2,3 commands, the general operations' guidance are as follows: 1. Line 1 displays the title of the command or parameters to change; 2. TOP right corner, display up and down arrow↑↓and pencil logo; 3. Line 2 display the current parameter sequence number and name, default is first item of level 1, that mean 11: enquiry volume totalizer; 4. Use the up or down arrow ↑↓or enter a digit number(0-9) to scroll/change the parameter name; 5. Press "L/GAL" key to adapt the current parameter; 6. Press backspace← to erase or back one char; 7. CANCEL key to exit the current setup menu, one step back; 8. When you enter level 3 commands from level 2, please turn on the switch of lock 2, after the menu operation, please turn off lock 2 switch.

Command Level 1	Command Level 2	Command Level 3
11:Query Tot Volume	21:Recall Txd Data	31:Set Volume Tot
12:Query Tot Sales	22:Online/Offline	32:Query Tot Change
13:Shift Volume	23:Reset Shift	33:Set Work Days
14:Other Tots	24:Price	34:Set Flowrate UPL
15:Date&Time	25:Valve Models	35:Refuel Interval
16:Default Preset	26:Master OFF Value	36:Scroll ON/OFF
17:Preset Value	27:Valve OFF Time	37:Other Tot ON/OFF
18:Version	28:Max Fuel-Money	38:Change Password
19:Enter Level 2	29:Max Fuel-Time	39:Reset Password
	210:Time Out	310:Sale Point
	211:Transition Time	311:Volume Point
	212:Protocol	312:Price Point
	213:Address	313:SV-Symbol
	214:Printer ON/OFF	314:VS-Symbol
	215:Print Contents	315:ID Card ON/OFF
	216:Keyboard ON/OFF	316:ID Card AUTH Mode
	217:Ctrlboard ON/OFF	317: Set Measure Unit
	218:Purlse Err ON/OFF	318: Save Settings
	219:Re-Print ON/OFF	319:Recover Setting
	220:Start Value	
	221:PlateNum ON/OFF	
	222:PrintOut Mode ON/OFF	
	223:Rounding	
	224:Key Pre-star	
	225:Printer Pinboard	
	226:Bypass valve	
	227:Enter Level 3	

Hereby the description and operation of 3 levels are shown as follows:

LEVEL 1:

1. Make sure the dispenser locate in the idle status;

2. Press “MENU” key, the password is recommended to input;

3. Input the default password “9876”, then press “L/GAL” key to enter Level 1;

Level 1's ITEM/DESCRIPTION/OPERATION			
No	Item	Description	Operation
11	Query Tot Volume	Query the electrical tot volume for each nozzle	Use the up and down arrow↑or↓ or digit number 18(available nozzles) to scroll/change nozzle No to display the tot volume; Press "CANCEL" to exit
12	Query Tot Sales	Query the tot sales for each nozzle	Use the up and down arrow↑or↓ or digit number 18(available nozzles) to scroll/change nozzle No to display the tot sales; Press "CANCEL" to exit;
13	Shift Volume	Query for the shift volume; The shift volume is the tot volume for normal refueling operation	Use the up and down arrow↑or↓ or digit number 18(available nozzles) to scroll/change nozzle No to display the shift volume; Press "CANCEL" to exit;
14	Other Tots	Query for other tots(other tot volume). Other tots is the volume when abnormal operated. Especially to prevent someone steal oil as little quantity. When fueling data is over 0.06 ltr/gal, it will show on the display. But if less than 0.06 ltr/gal, it will not show on the display, will be counted into the Other Tots	Use the up and down arrow↑or↓ or digit number 18(available nozzles) to scroll/change nozzle No to display the Other Tot volume; Press "CANCEL" to exit;
15	Date & Time	Query and set dispenser's current date and time	A.Press"L/GAL" key to enter into the date & time set process; B.Use the digit number to enter YEAR(4),MONTH(2),DATE(2),HOUR(2),MIN(2),SECOND(2)WEEKDAY(1) C.MUST BE 15 digits consecutively; D.Press "L/GAL" key to save and validate the setting date and time; E.Press "CANCEL" to exit.
16	Default Preset	Change default preset units(Sales or Volume)	Press "L/GAL" key to enter the interface of changing preset mode; Use up and down arrow ↑or↓(1 or 2) to change the preset default mode as litre/sale Press "L/GAL" key to adapt the modification; Press "CANCEL" to exit;
17	Preset Value	Change the fixed preset keys P1-P4's value; "P1","P2",P3","P4" is fixed sales amount preset key to preset how much to be refueled	Press "L/GAL" key to enter the setting interface of "Px" ; Use up and down arrow ↑or↓ to select the P1 to P4; Press "L/GAL" key to enter the related item, set the corresponding preset value; Press "L/GAL" to save and update the modified parameter set; Press "CANCEL" to exit;
18	Version	Query the software version	Press "L/GAL" key to enter the interface of checking program version; It displays the current software program version on display; Press "CANCEL" to exit;

LEVEL 2:

1. Make sure the operation locates under level 1;

2. Press “19” key, the interface indicates to show: Enter to Level 2;

3. Press “L/GAL” key, the password is recommended to input;

4. Input the default password “9876”, then press “L/GAL” key to enter Level 2 interface;

Level 2’s ITEM/DESCRIPTION/OPERATION			
No	Item	Description	Operation
21	Recall Txd Data	Recall the fueling data record(available for the last 200 sales records)	Press “L/GAL” key to select proper nozzle; Use the updown arrow ↑or↓or enter a digit number 1-8 available to scroll/change the nozzle number. Press “L/GAL” key to enter the related nozzle interface; Use digit number(1 to 200) to select the related transaction to display, 1 is always the latest transaction in historical record; Press “CANCEL” to exit
22	Online/Offline	Switchover Online/Offline mode	Press “L/GAL” key to enter into the “Online/Offline” mode; 1 is set “Offline” in default, 2 is set “Online”a indefault; Use updown arrow ↑or↓or input 1 or 2 to scroll/switchover the mode; Press “L/GAL” key after switchover the mode to save and update new setting; Press “CANCEL” to exit.
23	Reset Shift	Clear the shift volume data for all nozzles.	Press “L/GAL” key to enter into the “Reset Shift” interface; Use the updown arrow↑or↓to scroll and select nozzle number; Press “L/GAL” key, it recommends whether to reset or not, press “L/GAL” again, it will reset; Press “CANCEL” key to exit;
24	Price	Adjust the price for each nozzle	Press “L/GAL” key to enter into the “Price” interface; Use the updown arrow↑or↓to scroll and select nozzle number; Press “L/GAL” key, input the new price; Press ”L/GAL” key to save and update the new setting; Press “CANCEL” key to exit;
25	Valve Models	Select the valve models; Common valve means 2-stage valve; Ball valve means electrical ball valve (Normal	Press “L/GAL” key to select the valve model; Use updown arrow↑or↓to scroll(or input 1 or 2) to select proper valve model; Press “L/GAL” to save and update new setting; Press “CANCEL” key to exit;

		configuration choose Common valve)	
26	Master OFF Value	When system in Common model this item is valid. Set the advanced volume to turn off the master value. Normal meter range(0-99) Special meter range(0-255)	Press “L/GAL” key, select the corresponding nozzle; Press “L/GAL” key to enter the related nozzle menu, then input new Master OFF value; Press “L/GAL” key to save and update new setting; Press “CANCEL” key to exit;
27	Valve OFF Time	When system in Ball model this item is valid. Set the advanced volume to turn off the ball value	Press “L/GAL” key, select the corresponding nozzle; Use the undown arrow ↑or↓to scroll and select nozzle number; Input the new valve off time(0-200) Press “L/GAL” key to save and update new setting; Press “CANCEL” key to exit;
28	Max Fuel-money	Maximum total volume per transaction allowed; Range: 0-9999s	Press “L/GAL” key, the display shows current max fuel time; Input new Max Fuel-time(0-9999); Press “L/GAL” key to save and update new setting; Press “CANCEL” key to exit;
29	Max Fuel-time	Maximum total volume per transaction allowed; Range: 0-9999s	Press “L/GAL” key, the display shows current max fuel time; Input new Max Fuel-time(0-9999); Press “L/GAL” key to save and update new setting; Press “CANCEL” key to exit;
210	Time out	The lasting time that motor began working until stop running after lifting nozzle without fueling; Range:10-180s	Press “L/GAL” key, enter into the time out menu; Input the new time out value(10-180) Press “L/GAL” key to save and update new setting; Press “CANCEL” key to exit;
211	Protocol	Select the communication protocol to the FMS: 1: Comm; 2: Rusia664; 3: Rusia765; 4: AZT2.0; 5: Australia; 6: General	Press “L/GAL” key, enter into the protocol menu; Use undown arrow↑or↓to scroll(or input 1-6 available protocol) and select the suitable protocol; Press “L/GAL” key to save and update new setting; Press “CANCEL” key to exit;
213	Address	Preset communication address for fuel dispenser; Comm protocol is invalid;	Press “L/GAL” key, enter into the address menu; Input suitable communication address for dispenser; Press “L/GAL” key to save and update new setting;
214	Price	Adjust the price for each nozzle	Press “L/GAL” key to enter into the “Price” interface; Use the updown arrow↑or↓to scroll and select nozzle number; Press “L/GAL” key, input the new price; Press ”L/GAL” key to save and update the new setting; Press “CANCEL” key to exit;
25	Valve Models	Select the valve models; Common valve means 2-	Press “L/GAL” key to select the valve model; Use updown arrow↑or↓to scroll(or input 1 or

		stagevalve; Ball valve means electrical ball valve (Normal configuration choose Common valve)	2) to select proper valve model; Press “L/GAL” to save and update new setting; Press “CANCEL” key to exit;
26	Master OFF Value	When system in Common model this item is valid. Set the advanced volume to turn off the master value. Normal meter range(0-99) Special meter range(0-255)	Press “L/GAL” key, select the corresponding nozzle; Press “L/GAL” key to enter the related nozzle menu, then input new Master OFF value; Press “L/GAL” key to save and update new setting; Press “CANCEL” key to exit;
27	Valve OFF Time	When system in Ball model this item is valid. Set the advanced volume to turn off the ball value.	Press “L/GAL” key, select the corresponding nozzle; Use the undown arrow ↑or↓to scroll and select nozzle number; Input the new valve off time(0-200) Press “L/GAL” key to save and update new setting; Press “CANCEL” key to exit
28	Max Fuel-money	Maximum total sales per transaction allowed; Attention: this function will activate in advance of setting “Display Scroll ON” in level 3; Range: 0-999999999;	Press “L/GAL” key, the display shows current max fuelmoney value; Input new Max Fuel-money value(0-999999999); Press “L/GAL” key to save and update new setting; Press “CANCEL” key to exit;
29	Max Fuel-time	Maximum total volume per transaction allowed; Range: 0-9999s	Press “L/GAL” key, the display shows current max fueltime; Input new Max Fuel-time(0-9999); Press “L/GAL” key to save and update new setting; Press “CANCEL” key to exit;
210	Time out	The lasting time that motor began working until stop running after lifting nozzle without fueling; Range:10-180s	Press “L/GAL” key, enter into the time out menu; Input the new time out value(10-180) Press “L/GAL” key to save and update new setting; Press “CANCEL” key to exit;
211	Transition time	After lifting nozzle, the lasting time until display reset to 0; Range: 2-10s	Press “L/GAL” key, enter into the transition time menu; Input the new transition time value(2-10) Press “L/GAL” key to save and update new setting; Press “CANCEL” key to exit;
212	Protocol	Select the communication protocol to the FMS: 1: Comm; 2: Rusia664; 3: Rusia765; 4: AZT2.0; 5: Australia; 6: General;	Press “L/GAL” key, enter into the protocol menu; Use undown arrow↑or↓to scroll(or input 1-6 available protocol) and select the suitable protocol; Press “L/GAL” key to save and update new setting; Press “CANCEL” key to exit;

213	Address	Preset communication address for fuel dispenser ; Comm protocol is invalid; Range: 1-99	Press “L/GAL” key, enter into the address menu; Input suitable communication address for dispenser; Press “L/GAL” key to save and update new setting; Press “CANCEL” key to exit;
214	Printer ON/OFF	Set the software program use printer or not	Press “L/GAL” key, enter into the printer menu; Use undown arrow↑or↓to scroll(or input 1-2) and select the printer status(Printer ON/OFF, default is: 1 is Printer OFF); Press “L/GAL” key to save new setting, new setting is valid for all nozzles; Press “CANCEL” key to exit
215	Print Content	Edit the printing contents; When set printer ON, this item is valid;	Press “L/GAL” key, enter into the print contents menu; Use undown arrow↑or↓to scroll and check the print contents; Press “L/GAL” key to enter into qualified item, then use the pencil key to enter the editing interface, modify related content by inputting numbers, letter lower case or capital, backspace ← to erase a letter; Press “L/GAL” key to save new modifications; Press “CANCEL” key to exit; e.g. Company name: Station address: City: Tel Number: Currency: Dispenser No. … Nozzle No. Product1 … Productn Footer 1 Footer2 Footer2 Exit;
216	Keyboard ON/OFF	Under this item ON status, if keypad has any issue or faults, there will be an alarm and error code displaying on keypad display;	Press “L/GAL” key, enter into the “Keyboard ON/OFF” menu; Use updown arrow ↑or↓to scroll to convert keyboard ON/OFF(default is:1 Keyboard OFF): ; Press “L/GAL” key to save and update new setting new setting is valid for all nozzles; Press “CANCEL” key to exit
217	Ctrlboard ON/OFF	Under this item ON status, if Ctrlboard has any issue or fault, there will be an alarm and error code displaying on keypad display;	Press “L/GAL” key, enter into the “Ctrlboard ON/OFF” menu; Use updown arrow ↑or↓to scroll to convert Ctrlboard ON/OFF(default is:1 Ctrlboard OFF): ; Press “L/GAL” key to save and update new setting, new setting is valid for all nozzles; Press “CANCEL” key to exit;
218	PulseErr ON/OFF	Under this item ON status, if pulse has any issue or fault, there will be an alarm and	Press “L/GAL” key, enter into the “PulseErr ON/OFF” menu; Use updown arrow ↑or↓to scroll to convert PulseErr ON/OFF(default is:1

		error code displaying on keypad display;	PulseErr OFF): ; Press “L/GAL” key to save and update new setting, new setting is valid for all nozzles; Press “CANCEL” key to exit;
219	Re-print ON/OFF	After set this item ON mode, press “.” Key to re-print after fueling; This item is valid while set printer ON	Press “L/GAL” key, enter into “Re-print ON/OFF” menu; Use updown arrow ↑or↓to scroll to convert Re-print ON/OFF(default is:1 Re-print ON); Press “L/GAL” key to save and update new setting, new setting is valid for all nozzles; Press “CANCEL” key to exit
220	Start Value	Preset the minimum refueling volume or sales to startup dispenser. It will be not allowed to refuel if preset value less than the minimum limit. The start value(liter/sale) is associated to the preset value in level 1;	Press “L/GAL” key, enter into the “Start Value” menu; Input new Start value(minimum: Liter: 0.1L; Sale:0.1L*Price) Press “L/GAL” key to save and update new setting, new setting is valid for all nozzles; Press “CANCEL” key to exit;
221	Plate Num ON/OFF	Set the mode whether to print the vehicle plate No and Odometer No; Under this item ON status, after refueling, press “.”key to enter the interface to edit the plate number and odometer number. This item activates under 2 precondition: (1): Printer ON; (2): Printout Mode in Indonesia;	Press “L/GAL” key, enter into “Plate Num ON/OFF” menu; Use updown arrow ↑or↓to scroll to convert Plate Num ON/OFF(default is:1Plate Num OFF); Press “L/GAL” key to save and update new setting, new setting is valid for all nozzles; Press “CANCEL” key to exit;
222	PrintOut Mode	Set the PrintOut mode: (1): Common; (2): Indonesia;	Press “L/GAL” key, enter into the “PrintOut mode” menu; Use updown arrow ↑or↓to scroll to convert printout mode;(default is:1Common); Press “L/GAL” key to save and update new setting, new setting is valid for all nozzles; Press “CANCEL” key to exit
223	Rounding	Set the Rounding mode, this item take effect for “Non-preset”; Press “.”key to make dispenser stop fueling at an integral sale. (1):1; (2): 10; (3): 100;	Press “L/GAL” key, enter into the “Rounding” menu; Use updown arrow ↑or↓to scroll to select the right rounding digit;(default is:1:1); Press “L/GAL” key to save and update new setting, new setting is valid for all nozzles; Press “CANCEL” key to exit;
224	Key Pre-start	After set Key Pre-start ON: Before a “Non-preset” fueling, it’s necessary to press “CANCEL” key firstly;	Press “L/GAL” key, enter into the “Key Pre-start” menu; Use updown arrow ↑or↓to scroll to convert Key Prestart ON/OFF(default is:1: OFF); Press “L/GAL” key to save and update

			new setting, new setting is valid for all nozzles; Press “CANCEL” key to exit;
225	Printer Pinboard	While dispenser configure with multiple nozzles, each nozzle need to it’s own printer, here it’s necessary to add the printer pinboard to the syste	Press “L/GAL” key, enter into “Printer pinboard” menu; Use updown arrow ↑or↓to scroll to convert printer pinboard ON/OFF(default is:1: Pinboard OFF); Press “L/GAL” key to save and update new setting, new setting is valid for all nozzles; Press “CANCEL” key to exit;
226	Bypass valve	This bypass valve only validate under choosing ball valve item in level 2;	Press “L/GAL” key, enter into “Printer pinboard” menu; Use updown arrow ↑or↓to scroll to convert Use/Not Use Bypass valve(default is:1: Not Use Bypass valve); Press “L/GAL” key to save and update new setting, new setting is valid for all nozzles; Press “CANCEL” key to exit;
227	Enter Level 3	Enter Level 3 interface	Firstly, turn “Lock 1” clockwise 90°to the right position; Press “L/GAL” key to input password “9876”; Press “L/GAL” key again to enter Level 3;

LEVEL 3:

1. Make sure the operation locate under level 2, item 227;

2. Turn “Lock 1” clockwise 90°to the right position;

3. Press “L/GAL” key, the password is recommended to input;

4. Type in default password “9876” ;

5. Press “L/GAL” key, enter into Level 3 interface;

Level 3’s ITEM/DESCRIPTION/OPERATION			
No	Item	Description	Operation
31	Set Volume Tot	Modify the electronic totalizer by manual; The setting validate for single nozzle; Range: 0-4294967295;	Press “L/GAL” key, enter into “Set Volume Tot” menu; Use updown arrow ↑or↓to scroll to select corresponding nozzle(1-8 available nozzles); Press “L/GAL” key, enter the corresponding nozzle item; Press “SALE” pencil button to enter modifying interface; Input new Volume tot value ; Press “L/GAL” key to save and update new setting, new setting is valid for single nozzles; Press “CANCEL” key to exit;
32	Query Tot Change	Query the records of modifying volume totalizer;	Press “L/GAL” key, enter into the “Query Tot Change” menu; Use updown arrow ↑or↓to

		Only record the latest 10 times modification	scroll to select corresponding nozzle(1-8 available nozzles); Press “L/GAL” key, enter the corresponding nozzle item; Use updown arrow ↑or↓to scroll to check related records; Press “CANCEL” key to exit;
33	Set Work Days	Set the maximum working days for the fuel dispenser; Range: 0-365; 0: No limit; The setting value function validate for all nozzles;	Press “L/GAL” key, enter into the “Set Working Days” menu; Press “SALE” pencil button to enter setting interface; Input working days(0-365 available, default value is: 0); ; Press “L/GAL” key to save and update new setting; Press “CANCEL” key to exit;
34	Set Flowrate UPL	Set up-limit flowrate, it will alarm while exceeds the set value; Range: 0-9999L/Min; 0-9999Gal/Min	Press “L/GAL” key, enter into the “Set Flowrate UPL” menu; Press “SALE” pencil button to enter setting interface; Input up-limit flowrate value(0-9999, default value is: 0) ; Press “L/GAL” key to save and update new setting; Press “CANCEL” key to exit;
35	Refuel Interval	The refuel interval means the time from power off till power on, the delivery can be continued to calculate to the first tot; Range: 0s, 30-180s	Press “L/GAL” key, enter into the “Refuel Interval” menu; Press “SALE” pencil button to enter setting interface; Input refuel interval value(0, 30-180, default value is: 0) ; Press “L/GAL” key to save and update new setting; Press “CANCEL” key to exit
36	Scroll ON/OFF	Set the display Scroll ON, then the sales amount display digit can expand from 7 digits(max) to 9 digits(max); 1: Scroll ON; 2: Scroll OFF; New setting validate to all nozzles;	Press “L/GAL” key, enter into the “Scroll ON/OFF” menu; Use updown arrow ↑or↓to scroll to convert Scroll ON/OFF(default is:1: Scroll ON); Press “L/GAL” key to save and update new setting, new setting is valid for all nozzles; Press “CANCEL” key to exit;
37	Other Tot ON/OFF	Set Other Tot ON, which means other volume tot will accumulate to the current electronic volume tot; Other Tot: while fueling volume is less than 0.06L, it will accumulate to Other Tot	Press “L/GAL” key, enter into the “Other Tot ON/OFF” menu; Use updown arrow ↑or↓to scroll to convert Other Tot ON/OFF(default is:1 OFF); Press “L/GAL” key to save and update new setting, new setting is valid for all nozzles; Press “CANCEL” key to exit;
38	Change Password	Change the password of Level 1, Level 2, Level 3, respectively;	Press “L/GAL” key, enter into the “Change Password” menu; Use updown arrow ↑or↓to scroll to choose password level(Level 1&2&3); Press “L/GAL” key to enter new password input interface of selected level; Input new password(4 digits number); Press “L/GAL” key to prompt input new password again; Input new password and confirm again; Press “L/GAL” key

			to save and update new setting, new setting is valid for all nozzles; Press “CANCEL” key to exit;
39	Reset Password	Reset password to the default value	Press “L/GAL” key, enter into the “Reset Password” menu; Press “L/GAL” will ask you enter a password of changing password which is "1234". Input the changing password; Press “L/GAL” key to reset password; Press “CANCEL” key to exit;
310	Sale Point	Set decimal places for sale display.	Press “L/GAL” key, enter into the “Sale Point” menu; Use the updown arrow ↑ or ↓ or enter a digit number 0-2 to select the Point. Press “L/GAL” key to store the new set. Press “CANCEL” key to exit;
311	Volume Point	Set decimal places for liter/gallon display	Press “L/GAL” key, enter into the “Volume Point” menu; Use the updown arrow ↑ or ↓ or enter a digit number 0-3 to select the Point. Press “L/GAL” key to store the new set. Press “CANCEL” key to exit;
312	Price Point	Set decimal places for price display.	Press “L/GAL” key, enter into the “Price Point” menu; Use the updown arrow ↑ or ↓ or enter a digit number 0-3 to select the Point. Press “L/GAL” key to store the new set. Press “CANCEL” key to exit;
313	SV-Symbol	Set the conversion from sale to volume.	Press “L/GAL” key, enter into the “SV-Symbol” menu; Enter a digit number 0-9 to select the Point.（For example: Set to n, n rounddowm, n+1 roundup); Press “L/GAL” key to store the new set. Press “CANCEL” key to exit
314	VS-Symbol	Set the conversion from volume to sale.	Press “L/GAL” key, enter into the “VS-Symbol” menu; Enter a digit number 0-9 to select the Point.（For example: Set to n, n rounddowm, n+1 roundup); Press “L/GAL” key to store the new set. Press “CANCEL” key to exit;
315	ID-Card ON/OFF	Select ID Card ON or OFF.	Press “L/GAL” key, enter into the “ID Card ON/OFF” menu; Use ↑ or ↓ or 1 or 2 to select Keypad ON/OFF. Press “L/GAL” key to update the valid status. Press “CANCEL” key to exit;
316	ID-Card AuthMode	Select ID Card AuthMode. In Bounded Mode, the refuel times can be limited	Press “L/GAL” key, enter into the “ID Card AuthMode” menu; Use ↑ or ↓ or 1 or 2 to select ID Card AuthMode (1:Unbounded; 2:Bounded). Press “L/GAL” key to update the valid status. Press “CANCEL” key to exit;
317	Measure Unit	Set measure unit.	Press “L/GAL” key, enter into the “Measure Unit” menu; Use the up and down arrow ↑/↓or1/2/3 to choose measure unit. (1:Liter; 2:American Gallon; 3:Imperial Gallon); Press

			“L/GAL” key to store the new set. Press “CANCEL” key to exit;
318	Save Settings	To store the current parameters configurations for Recover settings command.	Press “L/GAL” key, enter into the “Save Settings” menu; Press “L/GAL” key will ask you to confirm for saving the settings command. save all the current settings to memory. Press “L/GAL” key again will save the current settings and display "Settings Saved". Press “CANCEL” key to exit;
319	Recover Settings	To get the stored settings by command 318: Save Settings.	Press “L/GAL” key, enter into the “Recover Settings” menu; Press “L/GAL” key will ask you to confirm for Recover Settings command. Press “L/GAL” key again will recover the stored settings as current parameters and display "Settings Recovered". Press “CANCEL” key to exit;
320	Key modify Price	Under online mode, whether enable to setup price by keypad. 1. Disable; 2. Enable	Press “L/GAL” key, enter into the “Key Modify Price” menu; Use ↑ or ↓ (or press digital number “1” or “2”) to select Key Modify Price mode (1:Disable; 2:Enable). Press “L/GAL” key to update the valid status. Press “CANCEL” key to exit;

2.3 Diagram of I2 electrical calculator working principle

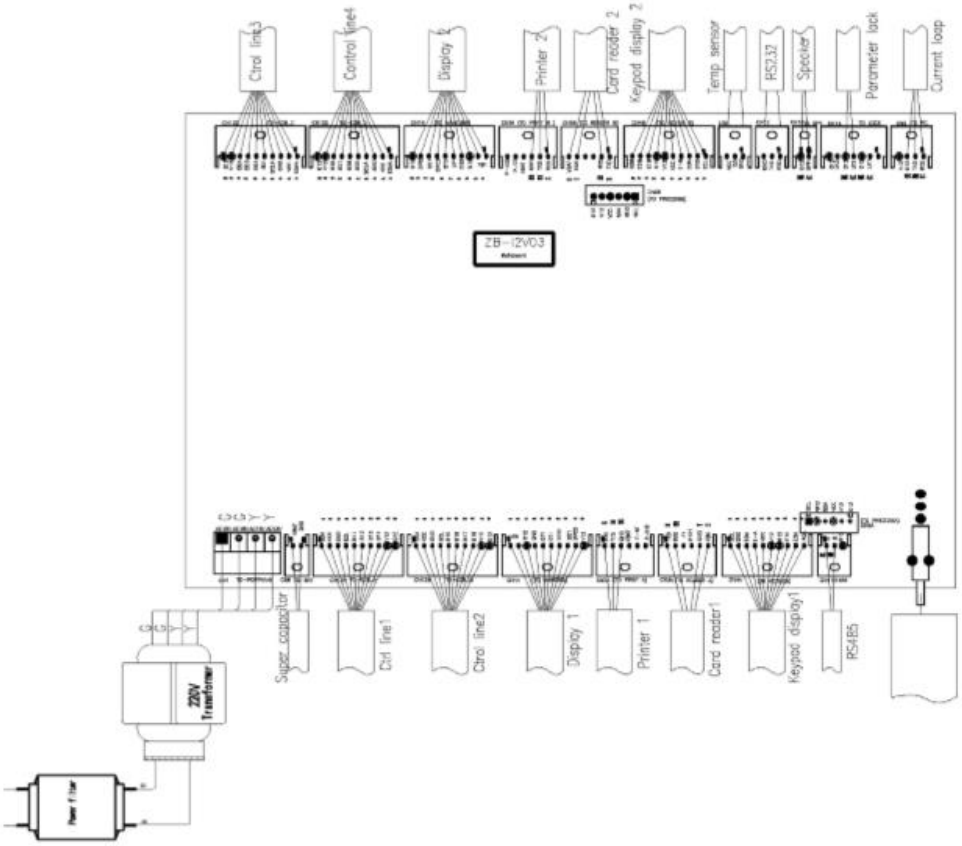


Fig 2.3(a) Diagram for I2 main board

Fig 2.3(a) Diagram for I2 main board

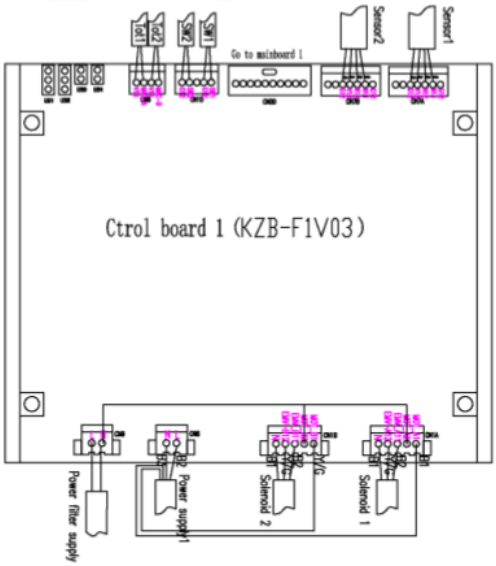


Fig 2.3(b) Diagram for F1V03 Control board

2.4 The transaction limit

The transaction limit is based on counting of the calculator operation time. Here the I2 calculator has 2 types of transaction limit for the fueling period.

(1) The transaction limit for each fueling For EHAD's I2 calculator, each fueling can be set the maximum fueling value, for item 28, Max Fuel Money, item 29, Max Fuel Time, after preset the pre-limit value, the nozzle will stop its fueling while overrun it's pre-limit.

This limit can be set by the supplier of the technology for the petrol station. When operation value reaches the pre-set limit, the calculator's price display and keypad display will show error code

(2) The transaction limit for the overrun tot sale(volume) Regarding sales totals and volume totals, Both of I2 calculator's transaction limit is 42949672.95, the decimal places can be adjusted according to different country's requirements. Once reaches to the limit value, the software program will NOT stop its function after overrun of the pre-set limit, but it will return to 0, then continue to count the fueling data.

e.g: here are 2 nozzles, we preset 100RMB, the current sales totals and volume totals are as bellow: nozzle 1: Sales tot: 42949660.00, Volume tot: 8456242.55L; price: 7.50RMB/L; nozzle 2: Sales tot: 207478.50, Volume tot: 42949665.00L; price: 7.50 RMB/L;

For nozzle 1:

Sales tot: 42949660.00+100=42949660.00+12.95+87.05=87.05; Volume tot: 8456242.55+100/7.50=8456255.88;

For nozzle 2:

Sales tot: 207478.50+100=207578.50; Volume tot: 42949665.00+100/7.50=42949665.00+13.3=42949665.00+7.95+5.35=5.35

2. Technical Data

Technical data of I2 calculator

Power supply(V)	220V（-10%——+15%）,50Hz
Safety fuse	250V/2A
Power consumption	50VA max
Coverage	IP20B
Operating temperature	-40℃——+70℃
Relative Humidity	20%——95%
Range of single count	0——9999.99L
Range of price	0.01——99999
Range of totalizer	Volume：0——42949672.95L; Sale：0——42949672.95
Maximum flow control	1200L/Min
Shaft encoder	Open-collector output, 2 channels, +12VDC

Maximum power loads	MOT— motor contactor	+9VDC——220VAC
	EMV1— high flow valve	+9VDC——220VAC
	EMV2— low flow valve	+9VDC——220VAC
	Shaft encoder power supply	+12VDC /max 30mA
Communication line	RS485: half-duplex(2 wires),baud rate:9600b/s(19200b/s optionally), the baud rate shall match with the same baud rate of FMS; Current loop: half-duplex (3 wires),baud rate:9600b/s(19200b/s optionally), the baud rate shall match with the same baud rate of FMS.	
Nozzle No per side	1/2/3/4	

Technical data of G5/B5 Display

Displays	High contrast LCD Displayed values(from top to bottom): Sale: 7 digits Volume: 6 digits Unit price: 5 digits
Operating temperature	-40℃——+70℃ Display with internal heating
Display dimension	Display：181*132*39mm； Price：181*74*39mm； Height of digits：25mm（1 inch）
Display data retention	Min. 30 Minute after power off

4. Diagnostics

4.1 Error message

When an error is detected:

* Delivery is stopped (on one or both sides depending on the error type)

* Error code is displayed on the unit price display (3rd line of the side display), where unit price is normally displayed. The error displayed in the form “Xxx” where “X” stands for the digital of “1” and “2”, “xx” stand for the error code item (from 01 to 13)

EHAD manufacturer classifies the error code into 2 series:

Series Ⅰ: error code for non-refueling status;

Series Ⅱ: error code for refueling status.

Series Ⅰ fatal error (unit price board displayed as 1xx)

Under the standby status, this error causes the prohibition of fueling. The dispenser is blocked for other transactions. These errors can be detected by the software program of I2 calculator automatically and send the corresponding error code to the unit price display.

When this error occurs, the user should consult the producer or the local agency. To recover the dispenser from this type of error, please refer to the related solutions.

Series Ⅱ fatal error (unit price board displayed as 2xx)

During the fueling process, this error will cause an immediate stop of fuel delivery on both sides of the dispenser. Also, the other transaction will be blocked. These errors can be detected during dynamic fueling performance by I2 series calculator.

When this error occurs, the user should stop fueling immediately, and consult the producer or the local agency. To recover the dispenser from this type of error, please refer to the related solutions.

4.2 Survey of Error Codes

Survey of errors series Ⅰ reported

Series Ⅰ fatal error codes and solutions		
Error code	**Description**	**Solution**
101	The keypad display shows alarm code and source of error, unit price board shows alarm code(101) and price alternately, speaker alarms: It detects “Nozzle Out”; a)Nozzle doesn’t put back while power on; b)Time interval is less than 1s between hang up\lift up nozzle; c)Multi-nozzles lifting up while lift 1 nozzle at the same refueling side; **d)Lift** nozzle again while refueling at the same side;	Check and re-hang up the nozzle, the alarm will be removed.

102	error, two unit price boards show alarm code “102” and price alternately, the speaker alarms, it’s forbidden to lift nozzle for fueling: It fails to read **“Battery RAM Error”** while power on to initialize	button battery(”+” and “-“) which installed on the main board, if it is less than 1.7VDC, replace for a new battery, the battery module is: CR2032(3V) Attention: Make sure power on all time while replacing the button battery.
103	Two keypad displays show alarm code and source of error, two unit price boards show alarm code(103) and price alternately, the speaker alarms, it’s forbidden to fuel; While prepare to lift nozzle for refueling, it detect “Out of Date”	Put back nozzle to nozzle boot, then set the correct working days in level 3, item 2;(normally, set this value as 0)
104	Two keypad displays show alarm code and source of error, two unit price boards show alarm code(104) and price alternately, the speaker alarms, it’s forbidden to fuel; While lift nozzle for refueling, it detects “Read Flash 45DB041 Error”;	(1) Power off and on again, sometimes it will release the blocking issue; (2) Replace the main board, this will release the blocking issue thoroughly.
105	Two keypad displays show alarm code and source of error, two unit price boards show alarm code(106) and price alternately, the speaker alarms, it’s forbidden to fuel; While lift nozzle for refueling, it detects “Read E2PROM 24LC16 Error”	(1) Power off and on again, sometimes it will release the blocking issue; (2) Replace the main board, this will release the blocking issue thoroughly.
107	Two keypad displays show alarm code and source of error, two unit price boards show alarm code(107) and price alternately, the speaker alarms, it’s forbidden to fuel; While lift nozzle for refueling, it detects “Write E2PROM 24LC16 Error”	(1) Power off and on again, sometimes it will release the blocking issue; (2) Replace the main board, this will release the blocking issue thoroughly.
108	Keypad display in the same side show alarm code and source of error, the unit price boards in the same side show alarm code(108) and price alternately, the speaker alarms; While lift nozzle for refueling, it detects “No coefficient”	Set new coefficient in level 4; normally, the coefficient value is 1000; 109
109	unit price boards in same side show alarm code(109) and price alternately, the speaker alarms, it’s forbidden to refuel this side ; while lift nozzle for refueling, it detects “KeyBoard Error	(1) Check the cable connect from main board to keypad, maintain or replace it if damaged; (2) Check the keypad, maintain or replace it if damaged

110	The related keypad display show alarm code and source of error, two unit price boards show alarm code(110) and price alternately, the speaker alarms, it's forbidden to refuel; While lift nozzle for refueling, it detects "CtrlBoard Error"	(1) Check the cable connected from main board to control board, maintain or replace it if damaged; (2) Check the control board, maintain or replace it if damaged
111	Non-refueling status: two keypad displays show alarm code and source of error, two unit price boards show alarm code(111) and price alternately, the speaker alarms, it's forbidden to fuel; Under refueling status: stop driving signals while refueling, two keypad displays show alarm code and source of error, two unit price boards show alarm code(111) and price alternately, the speaker alarms, but no affect for the next refueling it will alarm after 5s when under non-refueling offline mode, but 3s under refueling offline mode; it will detect "Off Line"	While connecting to FMS, set the communication mode to Online mode; then check the communication line connection, make sure it's fasten connected.
112	The keypad display of this side shows alarm and source of error, the unit price board shows alarm code(112) and price alternately, the speaker alarms, forbid to fuel this side; While lift nozzle for refueling, it detects "Preset Too Low"	Put back the nozzle, then set the preset value in level 2 item 20: Start Value; or preset the refueling value in an suitable range
113	The keypad display of this side shows alarm and source of error, the unit price board shows alarm code(113) and price alternately, the speaker alarms, forbid to fuel this side; While lift nozzle for refueling, it detects "Preset Too High"	Put back the nozzle, then set the preset value in level 2 item 8:Max-Fuel money; or preset the refueling value in an suitable range.

Survey of errors series Ⅱ reported

Series Ⅱ fatal error codes and solutions		
Error code	**Description**	**Solution**
201	**keypad display of the same side shows alarm code and source of error, the unit price board this side shows alarm code and price alternately, the speaker alarms ; while lift nozzle for refueling, the stopping time before delivery, when it detects exceeding the time value, it will show "Time Out" in keypad display**	**Put back nozzle to nozzle boot, then startup again; Or after put back nozzle, set the "Time Out" value into correct data. normally, the value range is 10s—180s The "Time Out" locate in level 2 item 210;**

202	**keypad display of the same side shows alarm code and source of error, the unit price board this side shows alarm code(202) and price alternately, the speaker alarms ; During refueling, when the refueling time exceeds "Max fuel-time", it will detect and show "Over Max Fuel-time" in keypad display.**	**Put back nozzle to nozzle boot, then startup again; Or after put back nozzle, set the "Max fuel-time" value into correct data. normally, the value range is 0s—9999s The "Max Fuel-time" locate in level 2 item29;**
203	**keypad display of this side shows alarm code and source of error, the unit price board this side shows alarm code and price alternately, the speaker alarms; During refueling, when the refueling speed exceeds flow rate upper limit, it will detect and show "Over Flow rate UPL" in keypad display.**	**Decrease the refueling speed, or put back nozzle to startup again.**
204	**The keypad display of this side shows alarm code and source of error, the unit price board of this side shows alarm code(204) and price alternately, the speaker alarms; After reaching the preset value, the driving signal doesn't stop, and refuel again. It detects and show "Oil Leakage"**	**(1) Put back nozzle, press "CANCEL" to release the issue; (2) Upgrade the software program; (3) Maintain or replace new main board.**
205	**keypad display of this side shows alarm code and source of error, the unit price board this side shows alarm code(205) and price alternately, the speaker alarms; During refueling, it will detects and show "Pulser Error"**	**(1) Check the cable which connect from pulser to main board; (2) Maintain or replace pulser.**
206	**KEYPAD Display of this side shows alarm code and Source Error, The unit price board Side shows alarm Code (206) and price alternately, the speaker alarms, During refueling it will detect and shows "magnetic Error"**	**(1) Check Cable witch connect from M-Counter to Ctrboard (KZB)** **(2) Maintain or replace M-Counter**

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