

AquaFlow Int'l, Inc.

Automated Bulk Water Loading Stations



AquaFlow II RFID Card Based Water System

System User Guide

Founded and Operated in Flagstaff, AZ

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An Introduction

In 1998, Jon Keller started a water dispensing company called WaterProducts.net Inc., servicing water companies in the Southwestern part of the United States. WaterProducts.net Inc. had a magnetic strip card system, which was commonly used by water companies.

In 2009, Jon started working on a replacement system that was better suited for modern technologies due to an end-of-life notice from the magnetic strip card manufacturer. Over time, Jon designed 3 water systems that were simple and flexible with customer's needs, and in 2011 AquaFlow Intl, Inc. was born. As of 2012, AquaFlow Intl, Inc. has more than one hundred stands in operation throughout the United States and overseas.

AquaFlow Intl, Inc. specializes in water payment systems that are easy to use and ensure guarantee payment to water companies for their bulk water sales. As previously mentioned, AquaFlow Intl, Inc. has 3 systems that make this possible: the AquaFlow II RFID card system, the AquaVendor card system, and the AquaTrack internet cloud-based system. Each system has a set of unique features that allow them to stand out from other common water systems. AquaFlow is skilled in retro-fitting existing systems as well as building a complete turnkey system from the slab up.

AquaFlow manufactures its own parts in Flagstaff, Arizona and its systems meet the requirements of the "Made in America" Act as well as the Davis Bacon Wage Act. The company is in good standing with the Arizona Corporate Commission as can be verified at: <http://ecorp.azcc.gov/search>. AquaFlow Intl, Inc. is an OEM manufacturer operating in the state of Arizona. No contractor license is required to provide installation oversight on our systems. AquaFlow Int'l, Inc.'s employees shall never drive a vehicle that is not owned and insured by the company. AquaFlow Int'l, Inc. maintains 4 million dollars worth of general liability insurance.

Contact Information

Mail Address:

Jon Keller, President
AquaFlow Int'l, Inc.
PO Box 2841
Flagstaff, AZ 86003

Shipping Address:

Jon Keller, President
AquaFlow Int'l, Inc.
4870 E Half Moon Dr.
Flagstaff, AZ 86004

Phone: 928-380-6164



System Overview

Definition:

The AquaFlow II is a RFID card based water system. The purse or value is held on the card. No communication is required between the site and an office computer. All data is stored on the customer's card and each card is numbered for easy tracking. Each transaction in the system is tracked and the logs can be transferred to a standard USB flash drive. All the data is contained in a .csv file format to use with 'Excel' or similar programs. The system is simple and easy to use for both the operators and customers. With the AquaFlow II system, you can remotely revalue a site manager's card at your convenience. No 3rd party is necessary. The system ensures direct contact between the customer and the water company.

System Requirements:

1. Power & water pressure (or pump) at the site. No communication line of any kind needed.
2. A way to re-value cards. (Office Unit or UTM)

Warranty:

A 1 year warranty is provided with the purchase of this system. AquaFlow Intl Inc. offers an extension of the maintenance and software warranty on a year by year basis. The extended warranty program gives you about a 30% discount on repair parts, free labor and priority service.

Our repairs are handled on a UPS basis. If your system goes down for any reason, simply give us a call and we will help you troubleshoot the system. If any part of the control system is not functioning properly and/or needs to be replaced, we will UPS you a new control board within 1 Business Day guaranteed. You then replace the control board (again, AquaFlow will be available via phone 24/7 to assist in any questions) and you are back up and running. We then require that you UPS your damaged board to us for evaluation and repair.

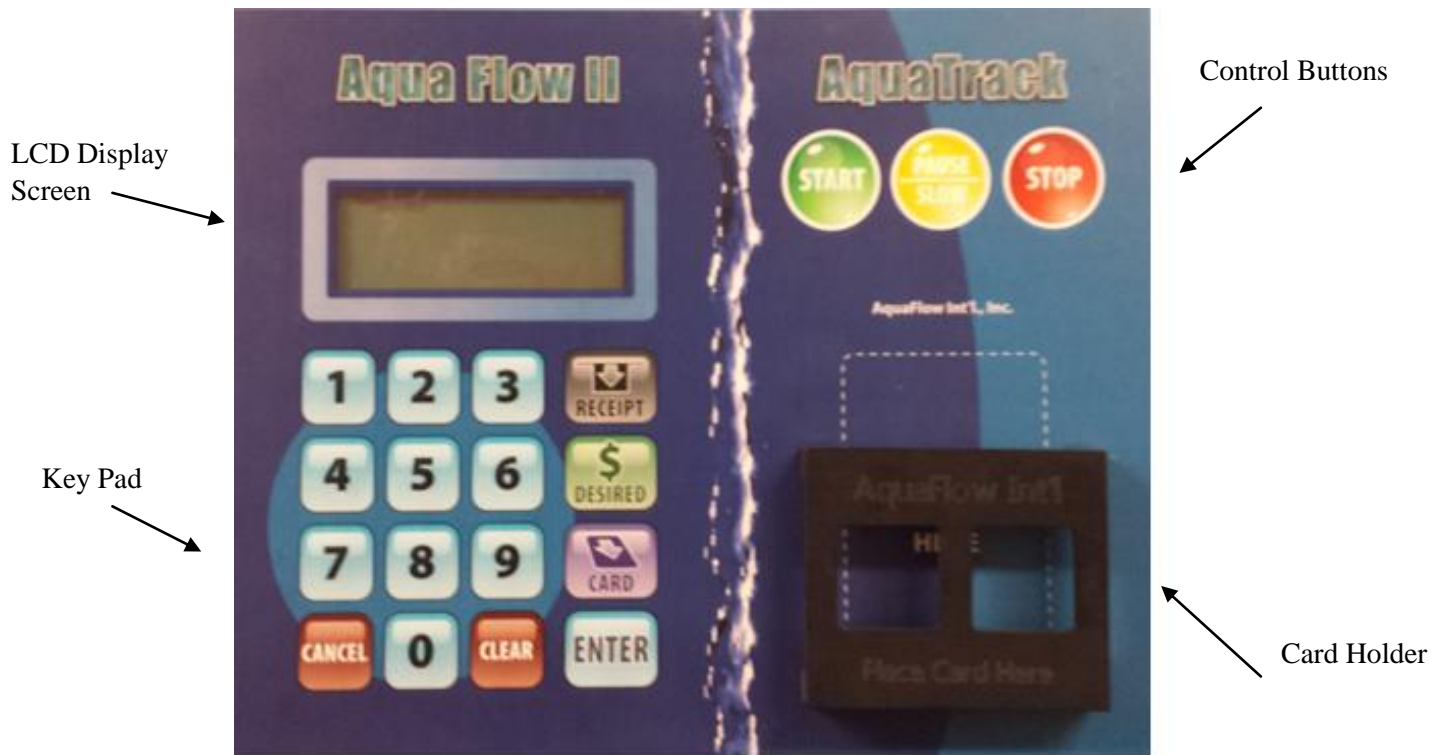
If the extended warranty is maintained, you shall be billed for the repair parts needed at the reduced rate. Also with the extended warranty, there is no charge for labor on repairs.

The AquaFlow II RFID card based system is warranted against factory defect for one full year. Damages not covered by the warranty are as follows: Acts of God, Acts of War, Acts of Terrorism, and Accidents (except by AquaFlow Int'l, Inc. personally), Power-related issues (such as lightning strikes or power surges), or vandalism.



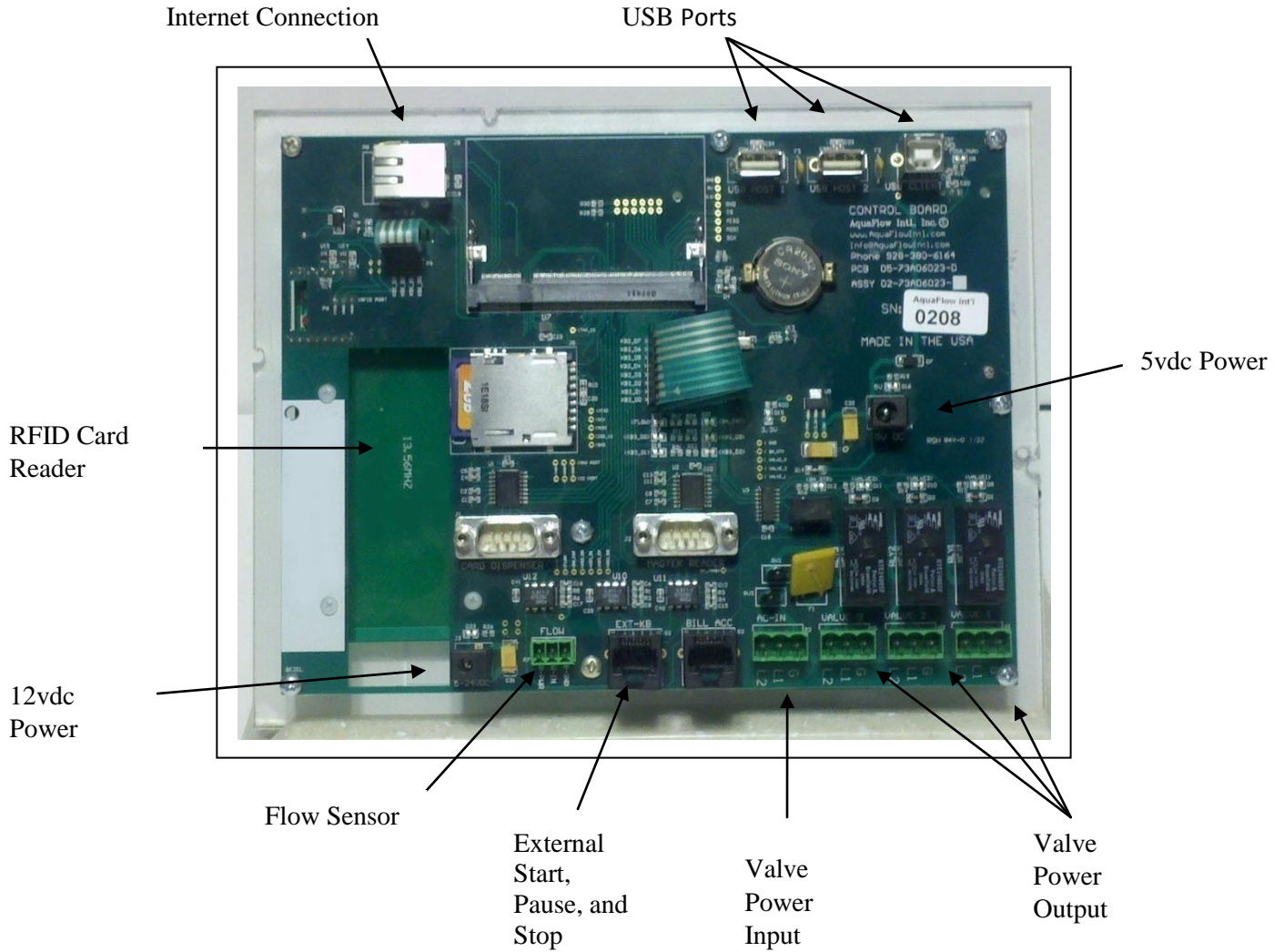
Faceplate Diagram:

Front of Faceplate



Control Board Diagram:

Back of Control Board



System Benefits

At AquaFlow, we are dedicated to researching and updating our systems as often as needed in order to provide satisfactory, quality service for our customers. The AquaFlow RFID II system has many features that make it stand out from other bulk water systems. Below are just some of the features that prove the AquaFlow RFID II system is the best system for you.

1. There is not a pre-assigned PIN for the cards; customers may choose their own PIN.
2. The system's flow sensor allows calibration to any measurement of units.
3. New RFID Smart Card technology, no contact necessary.
4. There is not a card slot to clean, which means low maintenance.
5. Encrypted data prevents copying cards.
6. All events are tracked and kept in system logs that can be stored on a USB Flash Drive for easy access.
7. The Customer Interface is able to control up to 3 exit ports at a time.
8. UPS battery protection
9. Lightning strike protection.
10. Custom programming available.
11. Low repair cost due to modular design.
12. A sealed system makes it water proof.
13. Video training is available online 24/7
14. The large keypad that makes it easy for gloved hands to use during cold weather conditions.
15. The system does not need any additional computers for operation. The customer interface/faceplate has a built in computer.
16. The system comes with 200 custom printed cards. Additional cards may be ordered at a low price rate, (in lots of 100) with no max limit to any order.
17. The system is made of modules, which means the screen can be replaced separately as is the case with the keypad, faceplate, computer, or interface modules.
18. Enclosures for the system are heated with a 9x12 thermostatically controlled heater. The enclosure is filled with 2" of rigid insulation for an R value greater than R11, plus the aluminum sheeting and FRP panels for an R value that is greater than 14.
19. Perfect for locations with spotty or no internet connection.



Detail Operation

Setting Up a Site Control Board:

1. Mount the control board and faceplate.
2. Place the provided USB flash drive in 'USB Host 2' port.
3. Connect the valve 'Input' and 'Output' power connections.
4. Connect the flow sensor power (12vdc).
5. Connect the 5vdc computer power.

**** The system will take about 1 minute to boot up. ****

6. Enter the 'Master Menu'.
7. Choose #12 to set the beep feature 'On' or 'Off' for keypad presses.
8. Choose #10 from the Menu to set the 'Date' and 'Time'.

****Date must be entered as MMDDYYYY****

****Time is in military time (ex: 17:00 for 5pm).****

9. Choose #20 to calibrate if it is the first time using system. (You can manually set the K, X, and Y factors if you already know what they are. Use #21 for K, #22 for X, and #23 for Y.)

****If you do not already know the factors****

You will be prompted to allow 200+ gallons to pass for calibration. Take a read on your meter, and press the green 'START' button. After a minimum of 200 gallons has passed, press the red 'STOP' button. You will then be prompted to enter the number of gallons that passed. Take a new read and subtract the number from the old read to get the amount of gallons. The system will then tell you the K,X, and the Y factors. Write these down. Many write them in a locked cabinet for future use.

10. Choose #24 to set the rates. Rates are always priced for 1000 units.

Rate 1: xx.xx	Price per 1000 on Tier 1 (Use the 'CARD' button for the decimal key.
Pri.Vol: xxxx	The number of units to apply Rate 1 to.
Rate 2: xx.xx	The rate to apply to the balance of the units per 1000 units.
Trn. Fee: xx.xx	Transaction fee per load.

****Note that if the customer has 2 tanks, he can fill both by using the yellow 'PAUSE' button in between fills to switch tanks, and he will only be billed for 1 transaction.****

Transferring Transaction Logs:

Every transaction at the site and at the Office Encoder is recorded and can easily be transferred to a standard USB flash drive. The Office Encoder is locked and needs an Operator Card to access the Encoder in order to add money to customer cards. The transaction file is in a .csv format that ensures easy use with Excel or other spreadsheet programs.

Simply plug your flash drive into 'USB Host 1'. The screen will then prompt you to 'PRESS 1' in order to transfer the logs. After pressing #1, please take your flash drive out to end the transfer.

Customer Use:

The customer is issued a card by either a CSR or through a purchase at a UTM. The customer then pays a prepaid amount to put on the card. IF this is done at the UTM, the customer will be asked to choose a 4 digit PIN for their card in order for them to be able to add money to their card.

When the customer arrives at the site, the system is in 'WAIT' mode, meaning it is ready for customer use. The customer will set the hose in order to fill their tank. They will then put their card in the customized holder. The customer is automatically prompted to enter their PIN. The balance on the card is shown, and the customer is then prompted to push the green 'START' button in order to begin their transaction. If they are at a 2 valve system, the customer is told to push '1' for 2" or '2' for 4" and so on.

The system will show the customer their balance as the amount of value decreases on the card. The customer may hit the red 'STOP' button at any time in order to end the transaction. If the customer does not hit the 'STOP' button, the transaction will end when the desired volume entered by the customer is reached or until the value on the customer's card shows a \$0.00 balance. The customer will only pay for what he receives. The system will then show the ending balance on the customer's card and how many units of water they just received. To end the transaction, the customer will simply need to remove his card from the holding slot. Customers may repeat the process as long as they have money on their card.

The system will not give water when the card balance is \$0.00

****If the customer removes their card during the transaction, they will be prompted to return their card to the slot in order to receive their refund. The system will beep as a reminder to do so for 15 seconds. If the customer does not return their card within the reminder time, the system will then reset itself to the 'WAIT' mode.****

If a customer claims they have not received their refund for a failed/incomplete transaction, it is best to always double check the logs for that day. For example, if the log shows that the customer received 100 units of water and paid \$100.00 for it, it is clear they did not return their card into the card holder in order to receive their refund.

Office Unit Operations:



The use of an Operator Card or a Manager Card is required in order to use the Office Unit.

Operator Cards: Each operator should be assigned their own Operator Card and their own PIN. The system logs every transaction with the following: Time, Date, Operator #, Customer Card #, Value added or subtracted, and the card's ending balance.

The operator starts by placing their card on the pad. They are then asked to enter their PIN. The system will then give them 4 options to select from (these are the only commands they will have access to):

- 34. – Add Value
- 35. – Subtract Value
- 36. – Change PIN
- 62. – Transfer Logs

Press #34- Adding value to an account. The operator is told to switch card to the user (or new) card. If it is a new card, the system prompts for the card number that is printed on the front of the card. Enter the number. The system then shows the current card balance and prompts for the value amount that is to be added to the account. For example: To add \$20.00, just enter the number 20 and press enter. If you want to add \$15.50, then you would use the 'Card' button for the decimal. (i.e. 15 "card", 50.) The system then shows you the new card balance and resets to 'Wait' mode.

Press #35- Subtracting value from an account. This works the same as the first option (#34) above. It is there in case you miss key an entry.

Press #36- Changing a customer's PIN. The operator will be prompted for the old PIN. After entering the old PIN, enter the new PIN twice. This protects customers' accounts. It prevents someone who finds a lost card and then tries to change the PIN to use it as their own. If the customer doesn't know the old PIN, then only the manager will be able to re-set the PIN.

Press #62- Transferring logs. First, plug a flash drive into the back of the Office Unit. The operator will be prompted to press #1 in order to transfer the logs. Logs are continuous and may be downloaded at any time. They are in a >csv file format to use with Excel or similar programs.

How To- 'Cheat Sheet' for Operators:

****Must be logged in for each action EXCEPT for #7****

1. Make a New Card:

- A. Press #34
- B. Remove OP card and put new customer's card on pad.
- C. Enter the card number that is on the front of the card.
- D. Enter the value to add to the card and press ENTER.

2. Add \$ to Customer Cards:

- A. Press #34
- B. Remove OP card and put customer's card on pad.
- C. Enter the value to add to the card and press ENTER.

3. Subtract \$ from Customer Cards:

- A. Press #35
- B. Remove OP card and put customer's card on pad.
- C. Enter the old PIN, press ENTER.

4. Change a Customer's PIN:

- A. Press #36
- B. Remove OP card and put customer's card on pad.
- C. Enter the old PIN, press ENTER.
- D. Enter new PIN, press ENTER.
- E. Re-enter new PIN, press ENTER.

5. Change Access Card to a Pre-paid User Card:

- A. Press #40
- B. Remove OP card and put customer's access card on pad.

6. Change Pre-Paid Card to an Access Card:

- A. Press #42
- B. Remove OP card and put customer's access card on pad.

7. Transfer logs to a Flash Drive:

- A. Plug a USB Flash Drive into the USB on the back of the Office Encoder.
- B. Press #1 and ENTER.

Manager Cards: The manager card is used for operations that the office only wants managers to have access to. Such things as erasing cards, changing the time and date on the unit, changing PINs when the customer doesn't know the old one, setting multipliers and such. There are quite a few new options coming out soon and future manuals will match the updated abilities.

Press #10- Set Date & Time. This allows the manager to set the date and time as used in the logging function. The date must be entered as MMDDYYYY. Time is in military time. (Ex: 17:00 for 5pm)

Press #12- Turning key chirp On/Off. Press #1 for turning the chirp 'On'. Press #2 to turn it 'Off'.

Press #17- Set the default volume limit. A future function.

Press #30- Card volume limit. A future function.

Press #31- Erase user info. This will revert the card back to a blank card. This is handy if you have a user that returns their card (moving away) and you want to re-assign or re-use the card for another customer. It makes the customer's card like new.

Press #32- Read card data. This displays the card information. This includes the balance on the card, rate multiplier and other data. This function is used to check and verify that cards are valid.

Press #33- Rate multiplier. This is a rate multiplier to give a specific card a different rate from the rate that is set at the site. It is a percentage of the rate set at the site. A number greater than 1 will make the water cost more than the site rate, and a number less than 1 and greater than 0 (i.e. .001 to .999) will lower the water rate this card pays. Limited to 3 decimals. This gives the manager flexibility when charging customers.

Press #34- Adding value to a card. **Please see page #10.**

Press #35- Subtracting value from a card. **Please see page #10.**

Press #36- Changing a customer's PIN. **Please see page #10.**

Press #37 Blank PIN. This erases the current PIN so that the customer can choose another PIN the next time they are at the site.

Press #38- Reset Card Volume. Future use.

Press #40- Residential User. Change card from a pre-paid user card to an access card.

Press #60- Upload Config. Re-loads the current config. file from the USB flash drive.

Press #61- Saves the backup of config. on the USB flash drive.

Press #62- Transferring logs. **Please see page #10.**

How To- ‘Cheat Sheet’ for Managers:

**** Must be logged in for all these actions except for #11****

1. Set the Time & Date:

- A. Press #10 and ENTER
- B. Enter Date in ‘MMDDYYYY’ format. (NO Enter key)
- C. Enter Time in Military Time in ‘HHMM’. (NO Enter key)

2. Set Chirp for Key Presses:

- A. Press #12
- B. Press #1 for ON or #2 for OFF.

3. Change the Card Multiplier to change what rate the customers shall pay at the site:

- A. Press #33
- B. Remove the manager card and put new customer’s card on the pad.
- C. Enter the card number on the front of the card.
- D. Enter the new rate multiplier, press ENTER.

4. Make a New Card:

- A. Press #34
- B. Remove the manager card and put new customer’s card on the pad.
- C. Enter the card number on the front of the card.
- D. Enter the value to add to the card and press ENTER.

5. Add money to Customer’s Cards:

- A. Press #34
- B. Remove the manager card and put customer’s card on the pad.
- C. Enter the value to add to the card and press ENTER.

6. Subtract money from Customer’s Cards:

- A. Press #35
- B. Remove the manager card and put the customer’s card on the pad.
- C. Enter the value to subtract from the customer’s card and press ENTER.

7. Change a Customer’s PIN:

- A. Press #36
- B. Remove the manager card and put customer’s card on the pad.
- C. Enter the old PIN and press ENTER.
- D. Enter the new PIN and press ENTER. Repeat.

8. To blank a PIN so the customer can choose a new one:

- A. Press #37
- B. Remove the manager card and put customer’s card on the pad

9. Change Access Card to a Pre-Paid User Card:

- A. Press #40
- B. Remove the manager card and put customer’s access card on the pad.

10. Change Pre-Paid Card to an Access Card:

- A. Press #42
- B. Remove the manager card and put customer’s access card on the pad.



11. Transfer the logs to a Flash Drive:

- A. Plug in a USB flash drive into the USB port on the back of the Office Encoder.
- B. Press #1 and ENTER

UTM Operations:

UTM stands for Unattended Teller Machine. The unit is ideally located at gas stations or similar locations near the water loading site. A UTM allows the customers to add value to their cards without having to go to the water company's office.

The UTM can be equipped with a credit card reader or a bill acceptor. It can also be equipped with both options if desired. The UTM also offers a card dispenser if you desire to sell cards from the UTM. The UTM logs all transactions made on the UTM for accountability.

Options:

- Credit Card Reader
- Bill Acceptor
- Card Dispenser
- Receipt Printer

The UTM is designed for self service applications.

Error List

- 10** Non-System Card, AFI is not recognized
- 11** No Water Flow Detected
- 12** Run Away Condition Detected
- 13** Run Away Protection Activate because of error 12
- 15** Card Is Blocked, Card has been blocked cannot use.
- 12A** Card ID = ""
- 12B** Card ID contains characters other than numbers
- 12C** Card PIN = ""
- 12D** Card PIN contains char other than numbers
- 12E** Balance on card is greater than Limit in Config
- 12-17** Balance greater than value in config.
- 12-18** Card Volume is higher than allowed
- 12X** out of try method without assignment of error (unlikely)
- 16** Card is not authorized type for Site Type
Also con trigger if they are using a bank card with RFID built in.
- 14** Pin Change Failed
- 18** CardTypeChange failure to change to Residential.
- 19** CardTypeChange failure to change to Commercial.
- 20** CardTypeChange failure to change to Access
- 21** Reset User Info failure
- 22** Change card volume failure
- 22** Change card volume failure
- 23** Debit Card Failed
- 24** Credit Card Failed
- 25a** Card is Blank and not implemented yet
- 25b** Card is blank and not processed
- 25c** Virtual Master Car Creation failed
- 25d** Read Chipworkx Card Failed
- 26** Card data not updated after transaction
- 27** Card not replaced in time
- 30** Make Master Failed
- 31** Make Manager Failed
- 32** Make Operator Failed
- 33** Make Maintenance Failed
- 34** Make Residential Failed
- 35** Make Commercial Failed
- 36** Make Access Failed
- 37** Reset Pin Failed
- 38** Change to Residential Failed
- 39** Change to Commercial Failed
- 40** Change to Access Failed
- 41** Reset Card Info Failed
- 42** Read Card Failed
- 43** Read Card Secure Failed
- 44** Change Mult. Failed
- 45** Init New Card failed
- 46** Card not found in time

Master Menu

- 01 Set Deployment
- 02 Set Deploy Type
- 03 Set Site Number

Site Options:

- 10 Set Date & Time
- 11 Use Day Save Time
- 12 Buzzer ON/OFF
- *13 Use Time ON/OFF
- *14 Set Time ON
- *15 Set Time OFF
- *16 Set Tran Volume Limit
- *17 Def. Per Volume Limit
- 18 Printer Test

Option Methods:

- 20 Calibrate Option
- 21 Set K Factor Option
- 22 Set X Factor Option
- 23 Set Y Factor Option
- 24 Set Rates

Modify Cards:

- *30 Card Vol. Limit
- 31 Erase User Info.
- 32 Read Card Data
- 33 Card Multiplier
- 34 Add Value
- 35 Subtract Value

Change Card To:

- 40 >Residential
- 42 >Access

Block Cards:

- *45 Add Block Card
- *46 Remove Block
- *47 List Block Cards
- *48 List Blocked

Make Cards:

- 50 Manager
- 51 Operator
- 52 Maintenance
- 53 Aqua Flow Master
- 54 User \$=20
- 56 Access Card

Config. Options:

- 60 Upload Config.
- 61 Save B.U. Config.

Log Options:

- 62 Transfer Logs
- *63 Only Last Month
- *64 Erase Tran. Log

UTM Options:

- *65 Allow Printer Log
- *66 Remove Money
- *67 Set Card Cost

* Future Use

Additional Options

Site:

1. Receipt printer
2. Multiple exit ports
3. Error light
4. Solar power
5. Backup heater

Office Unit:

1. Receipt printer

UTM:

1. Bill accepter
2. Credit card reader
3. Card dispenser
4. Receipt Printer

General Water Fill Rates

- ❖ 2" line fills at a rate of 80 -120 GPM (50-80psi) depending on water pressure. A 2,000 gallon truck would take about 20 minutes to fill at 100gpm.
- ❖ A 3" line fills at a rate of 350 -450 GPM (50-80psi) depending on water pressure. A 2,000 gallon truck would take about 6 minutes to fill at 350gpm.
- ❖ A 4" line fills at a rate of 600 -800 GPM (50-80psi) depending on water pressure. A 5,000 gallon truck would take about 6 to 8 minutes to fill at 600gpm.
- ❖ The most common size station is 2".
- ❖ You can have either an 'overhead loading station' or a 'side loading station'.
- ❖ We can retrofit our systems into your existing station(s), or provide a turnkey solution.
- ❖ Our system can run multiple (up to 3) valves with one customer interface. (ie... customer can choose between a 2" overhead, a 3" side loading, or a 1/2" 5 gallon fill from the same customer interface).

Note: one customer loading at a time.

Glossary

<u>Calibration:</u>	Setting the Flow Sensor to match the volume on the meter.
<u>K Factor:</u>	The K Factor is the number of electronic pulses the Flow Sensor sends to equal 1 unit of measurement. A 2” system using US gallons is normally set somewhere around 100 pulses. The system makes setting the K factor easy.
<u>X Factor:</u>	The X factor is the number of units that pass from the time you press the stop button until the water stops flowing. This is the amount of time the valve takes to close.
<u>Y Factor:</u>	The Y factor is the number of seconds the system will wait for water to flow past the flow sensor.
<u>Master Menu:</u>	This is the setup menu where all preferences and settings can be set for the system.
<u>Price Per 1000:</u>	This is the cost of water per 1000 units of measurements.
<u>Transaction Charge:</u>	The system allows you to charge a ‘per fill up’ price in addition to the rate you charge for the volume of water. If a customer has a tank on the truck and another on a trailer, the customer can fill the truck tank and then hit the ‘PAUSE’ button. The customer then can move the truck to fill the trailer’s tank. The customer hits the green ‘START’ button to continue the fill. In this instance, the customer would only pay 1 transaction charge.
<u>Office Encoder:</u>	The re-value station for the RFID cards. With this box, the cashier or operator can add value to customer cards.
<u>Operator Card:</u>	This is the card the cashier or CSR at the office will use. It gives the permission to add value to an account, subtract value from an account, change PINs and transfer logs.
<u>Manager Card:</u>	This is the card the manager of the office will use. It gives them the authority to do all the things an operator does and more. (Such as changing the rate at the site, changing a customer’s PIN if the customer does not know the old PIN etc.)
<u>UTM:</u>	Unattended Teller Machine
<u>CSR:</u>	Customer Service Representative
<u>RFID:</u>	Radio Frequency Identification

RFP Data

1. Company:

- 1.1. Company must have been in business of selling bulk water loading systems for 10+ years.
- 1.2. Company must maintain a minimum of \$2,000,000 of general Liability Insurance.
- 1.3. Company must maintain a 24/7 tech support line.

2. Enclosure:

- 2.1. Enclosure height to allow for a person to stand and do any repairs needed.
- 2.2. Enclosure to be constructed of corrosion resistant materials with protective coatings as necessary.
- 2.3. Enclosure shall be insulated with a minimum of 2" of rigid insulation.
- 2.4. Enclosure shall have a thermostatically controlled heater.
- 2.5. Enclosure shall have an Electrical Sub Panel box inside.
- 2.6. Enclosure shall have a full height door.
- 2.7. Enclosure shall have a GFI electrical outlet.
- 2.8. Enclosure shall have a light controlled by a light switch.

3. Water Components:

- 3.1. Enclosure shall have a RP style backflow device.
- 3.2. Enclosure shall have a flow sensor with an accuracy factor of 1.5%.
- 3.3. Enclosure shall have a stainless steel 24vdc electronically controlled valve.
- 3.4. Enclosure shall have a stainless steel 24vdc electronically controlled drain valve (if there is an overhead loading port).

4. Water System:

- 4.1. System shall be controlled by a Micro Computer.
- 4.2. Customers shall use a RFID card and PIN to access the water.
- 4.3. System shall have the ability to track an unlimited number of card user's transactions.
- 4.4. The RFID card data shall be encrypted on the card.
- 4.5. A communication line or service shall not be required at the site.
- 4.6. System shall have the ability to charge a transaction charge per load.
- 4.7. System shall have the ability to charge based on a two tiered rate structure.
- 4.8. System shall have the ability to supersede the default rate for any customer.
- 4.9. System shall have the ability to upload logs from the system onto a USB flash drive.
- 4.10. System shall have the ability to control up to three exit ports with one controller.
- 4.11. System shall have the ability to track all transactions.
- 4.12. System shall have 3/4" x 3/4" keys for use by gloved hands.
- 4.13. System shall be modular in design.
 - 4.13.1. The screen shall be able to be replaced separately.
 - 4.13.2. The computer shall be able to be replaced separately.
 - 4.13.3. The control board shall be able to be replaced separately.

The faceplate with keypad shall be able to be replaced separately.