TORNATECH

LISTEN DEVELOP LEAD

INSTALLATION AND MAINTENANCE MANUAL FOR DIESEL ENGINE FIRE PUMP CONTROLLERS MODEL LFD

ViZi TOUCH

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Introduction 1

Diesel engine fire pump controllers are designed to automatically start a diesel engine driven fire pump upon detection of an automatic start pressure switch in the fire protection system. A diesel engine fire pump controller provides automatic & manual starting. An automatic start is controlled by a pressure switch or by remote automatic devices as deluge valve. The "Operate Manual Start Test Pushbutton" implements a way to simulate the use of the "Emergency Pushbutton" by being activated after an automatic start followed by a stopping of the Firepump, or following a "Engine Fail to Start" alarm. A manual start is controlled by an Emergency Start pushbutton, hardwired to the relay board, that can securely start the engine. The diesel engine fire pump controller includes two battery chargers to maintain the engine batteries continuously charged.

Types of Diesel Engine Fire Pump Controllers

FIRE PUMP CATALOG NUMBER

MODEL No. EXAMPLE : LFD-12-220
Model Prefix LFD
Battery Voltage 12 : 12V
Incoming Voltage 220: 208/240V 50/60Hz

Methods of Starting/Stopping

The controllers are available as combination automatic / non-automatic.

METHODS OF STARTING

OPERATE MANUAL START TEST
The engine can be started by using this pushbutton after a “Fail to Start” alarm or after an automatic start followed by a stop. This method of starting will activate the last cranking starters that did not attempt to crank, and is in parallel with the “Emergency Start” button.

EMERGENCY START
The engine can be started from the Emergency Start Push Button located behind the breakable cover.

REMOTE AUTOMATIC START, DELUGE VALVE START
The engine can be started from a remote location by momentarily opening a contact of a pressure switch.

SEQUENTIAL START
In case of a multiple pump application, it may be necessary to delay the starting of each motor when there is a water pressure drop to prevent simultaneous starting of all motors.

METHODS OF STOPPING

MANUAL STOP
Manual stop is done by pressing the STOP push button. Note that pressing the stop push button will stop the engine in any circumstance, but if a starting demand is still present, the controller will initiate a cranking sequence upon releassing the STOP push button.

AUTO MODE BYPASS
An “Auto Mode bypass” switch is accessible from inside the enclosure door. If this switch is placed in “Auto Mode bypass”, the controller will not initiate a cranking sequence from an automatic starting request. Use only for maintenance operations. This will ring the bell.

Cranking Sequence

When an automatic start signal is received by the controller, a cranking sequence is instigated. A cranking sequence is composed of 6 cranking attempts of 15 second separated by 10 second pauses. An alternation is made between the 2 batteries. During a cranking attempt, if no RPM is detected by the controller for 4 second, a pause of 1 second is made and the cranking attempt continues. This allows the movable pinion of the motor to re-engages with the flywheel gear rim. If the motor speed does not reach 120RPM but is higher than 0 RPM after 4 second of cranking, the cranking attempt is interrupted and the battery is declared weak. Further cranking attempt are made drawing power from the other battery to complete the 6 attempt sequence. If both batteries are declared weak, the fifth and sixth cranking attempts are made drawing power from both batteries simultaneously.

Weekly Test

- A weekly test is suggested to be carried out once a week by a qualified operator.
- The steps to realize this procedure are displayed on the controller door.
- The purpose of this test is to verify the normal operation of the fire pump, the engine and the controller.
- The procedure includes an automatic start and a manual start of the engine.
- The operator should be present the whole duration of this test.
- During the test, pay a special attention to any unusual sound, vibration or behavior of the engine, the pump or the controller.
- Stop the engine if an undesired alarm is activated during the test.
- Resolve any occurred problem before resuming the procedure.
- Contact the supplier if a problem cannot be resolved by the local technician.

Installation 2

The controller is built in accordance with the latest edition of the LPS1236 Standard: Requirements for control panels for diesel driven pumps used in automatic sprinkler installations.

This controller is designed to be used with approved engine without a speed switch, using a magnetic pickup for analog management of the Engine Run signal and Overspeed signal, shown using an on-screen gauge on the ViZiTouch. Find more information on the senders section of this manual.

Location

The controller shall be located as close as practical to the engine/motor it controls and shall be within sight of the engine/motor. The controller shall be located or protected such that it will not be damaged by water escaping from pump or pump connections. Current carrying parts of the controller shall be not less than 12 in. (305 mm) above the floor level.

The controller is suitable for use in locations subject to a moderate degree of moisture, such as a damp basement. The pump room ambient temperature shall be between 32°F (0°C) and 122°F (50°C) (If a temperature option is included, see the rating label for maximum temperature).

The standard controller enclosure is rated IP 55. It is the installer's responsibility to insure that either the standard enclosure meets the ambient conditions or that an enclosure with an appropriate rating has been provided. Controllers must be installed inside a building and they are not designed for outside environment. The paint color may change if the controller is exposed to ultraviolet rays for a long period of time.

Mounting

The fire pump controller shall be mounted in a substantial manner on a single incombustible supporting structure. Wall mounted controllers shall be attached to the structure or wall using all four (4) mounting ears provided on the controller with hardware designed to support the weight of the controller at a height not less than 12 in. (305 mm) above floor level. Floor mounted controllers shall be attached to the floor using all holes provided on the mounting feet with hardware designed to support the weight of the controller. The mounting feet provide the necessary 12 in. (305 mm) clearance for current carrying parts.
A concrete slab is recommended to avoid water accumulation at the controller's feet.

Storage

If the controller is not installed and energized immediately, Tornatech recommend following the instructions from the chapter 3 of the NEMA ICS 15 standard.

Wiring and Connections

Electrical Connections

A licensed electrician must supervise the electrical connections. The dimension drawings show the area suitable for incoming power and motor connections. No other location shall be used. Only watertight hub fittings shall be used when entering the cabinet to preserve the IP rating of the cabinet. The installer is responsible for adequate protection of the fire pump controller components against metallic debris or drilling chips. Failure to do so may cause injuries to personnel, damage the controller and subsequently void warranty.

Energy Consumption

Diesel Controller with boost charger and Lead Acid Batteries			
Model / State		220/ 240VAC	VDC Output
12VDC / @	No charge	0.5A	13.8V
12VDC / @	Full charge*	2A	
24VDC / @	No charge	0.5A	27.6V
24VDC / @	Full charge*	2A	

Diesel Controller with boost charger and NiCad Batteries			
Model / State		220/ 240VAC	VDC Output
12VDC / @	No charge	0.5A	14.1V
12VDC / @	Full charge*	2A	
24VDC / @	No charge	0.5A	28.2V
24VDC / @	Full charge*	2A	

*5 amps through each battery

Sizing

Wiring between controller and engine (terminals 1,9,10,12) must be stranded #10 AWG or 6mm2 as minimum.
Wiring between controller and engine (terminals 6,8,11) must be stranded #8 AWG or 10mm2 as minimum.

Power supply wiring must be stranded #14 AWG or 2.5mm2 as minimum.
Incoming power supply terminals are sized for #16 AWG (1mm2) to #6 AWG (16mm2) wire.

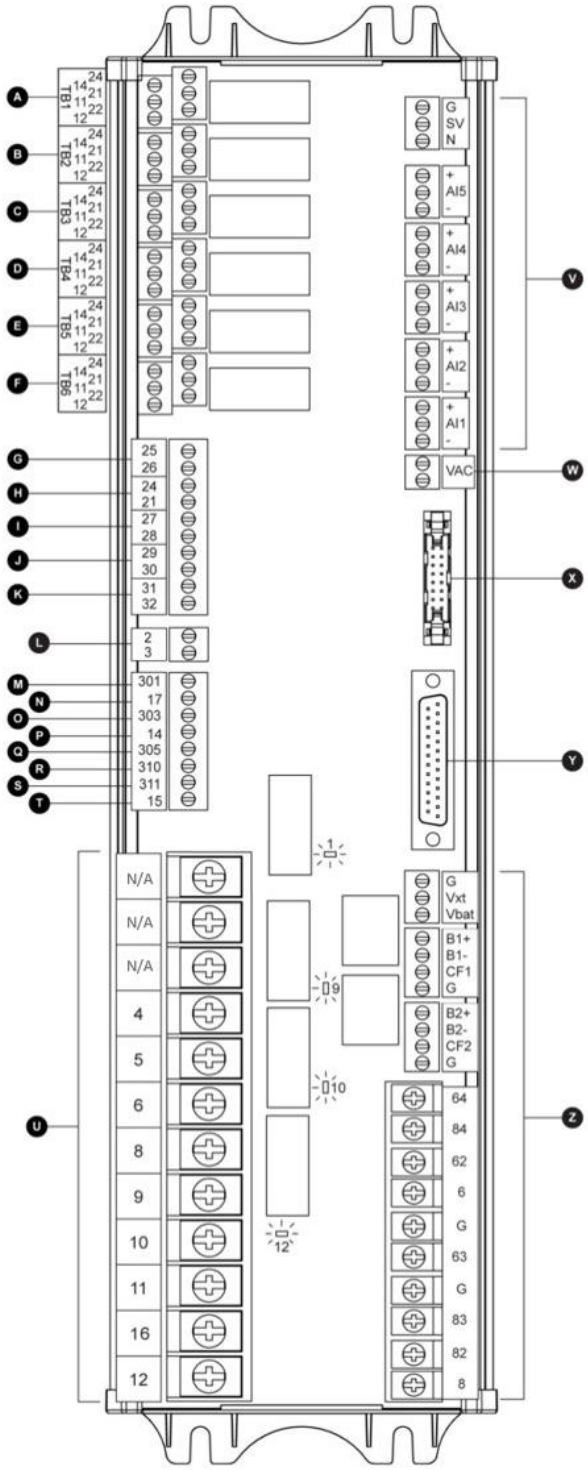
Incoming Power Connections

Diesel engine driven fire pump controllers shall be powered by a dedicated source protected by a fuse or circuit breaker. Verify the label on the cabinet to select the correct protection. Always follow this procedure when connecting or disconnecting the controller: Connect both batteries before connecting the AC power. Disconnect the AC power before disconnecting the batteries. Disconnecting the batteries while the AC is connected may result in severe damage to the controller electronic boards.

Circuit protection

CB1 protects battery charger 1 and CB2 protects battery charger 2. CB3 protects the control circuit from battery 1 and CB4 protects the control circuit from battery 2.
Always follow this procedure when connecting or disconnecting the controller: Connect both batteries before connecting the AC power. Disconnect the AC power before disconnecting the batteries.

Terminal Strip Descriptions



Z: Factory reserved power connections

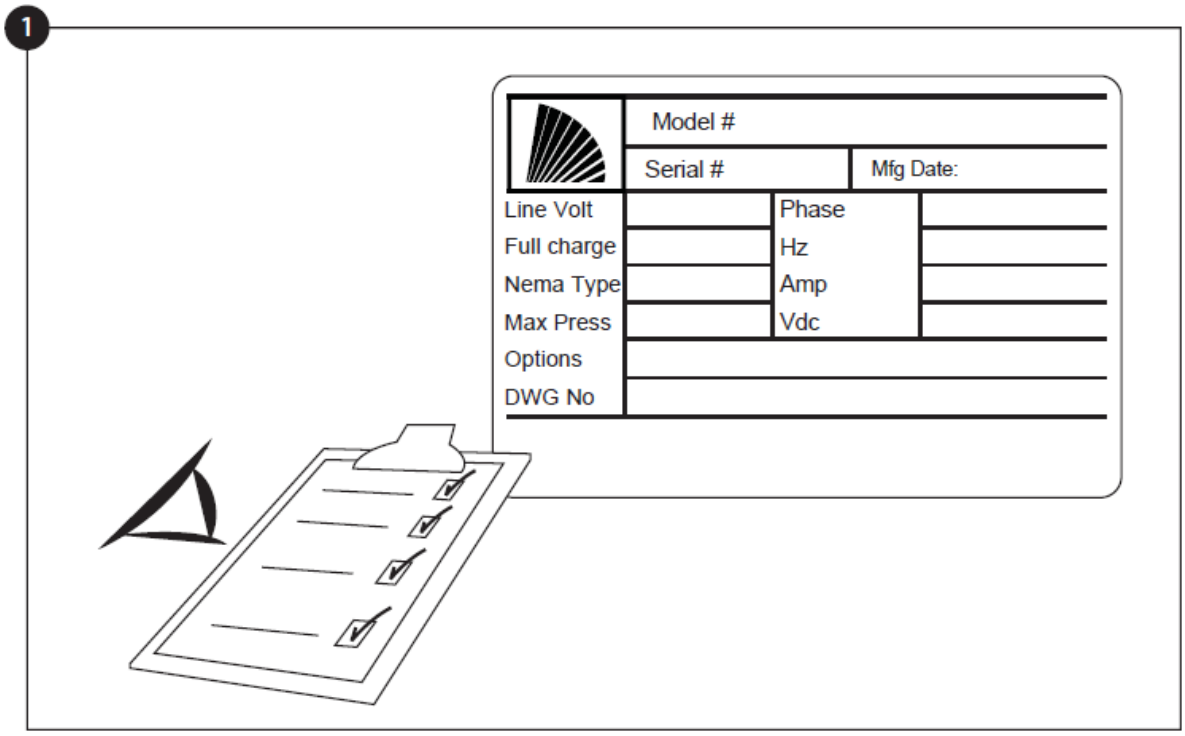
A-F : Alarm Output Terminals
(DPDT Relay, 11/21:Common, 12/22:Normally Closed, 14/24:Normally Open):
A: Common Trouble (fail safe)
B: Fan / Louver Activation
C: Engine is running
D: Automatic Start Unavailable
E: Pump Fail to Start
F: Pump on Demand

G-T : Field Input Terminal
(Dry Contact Only: Voltage Free):
G: Emergency Start Push Button (NO)
H: Pressure Switch Start (NC)
I: Deluge Valve Start (NC)
J: Pump Failed
K: Low Fuel Level (NO)
L: Magnetic Pickup
M: Not Used
N: Fuel Injection Fault
O: Not Used
P: ECM Fault
Q: Not Used
R: Not Used
S: Not Used
T: Low Engine Temperature

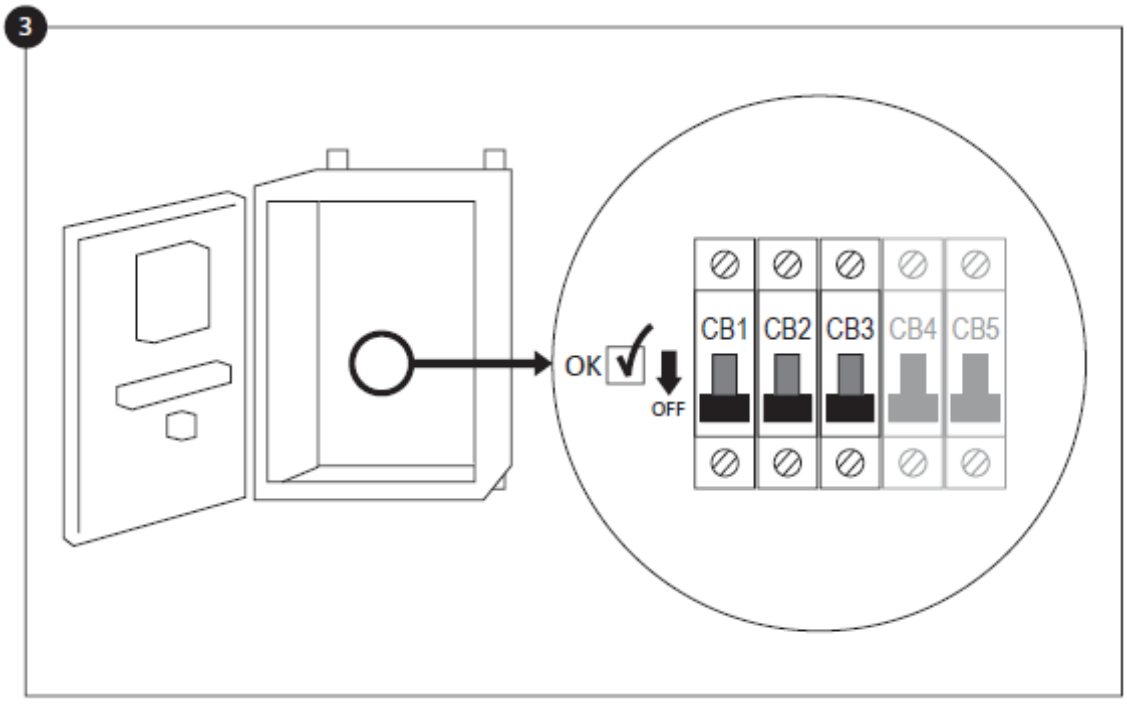
U : Engine Terminals :
The terminals are numbered according to the standard:
1 - Not used
2 - Not used
3 - Not used
4 - Low Oil Pressure
5 - High Engine Temperature
6 - B1 : battery #1 positive
8 - B2 : battery #2 positive
9 - C1 : start contactor #1
10 - C2 : start contactor #2
11 - GND : Ground
16 - Low Temperature Switch -
12 - ST : Stop fuel solenoid valve
(ETS - Energized To Stop)

V: Analog inputs
SOL V: Not Used
AI1: Not Used
AI2: Not Used
AI3: Not Used
AI4: Not Used
AI5: Not Used
W: 220Vac Power Supply monitoring
X: CANBUS to IO cards
Y: CANBUS to ViZiTouch

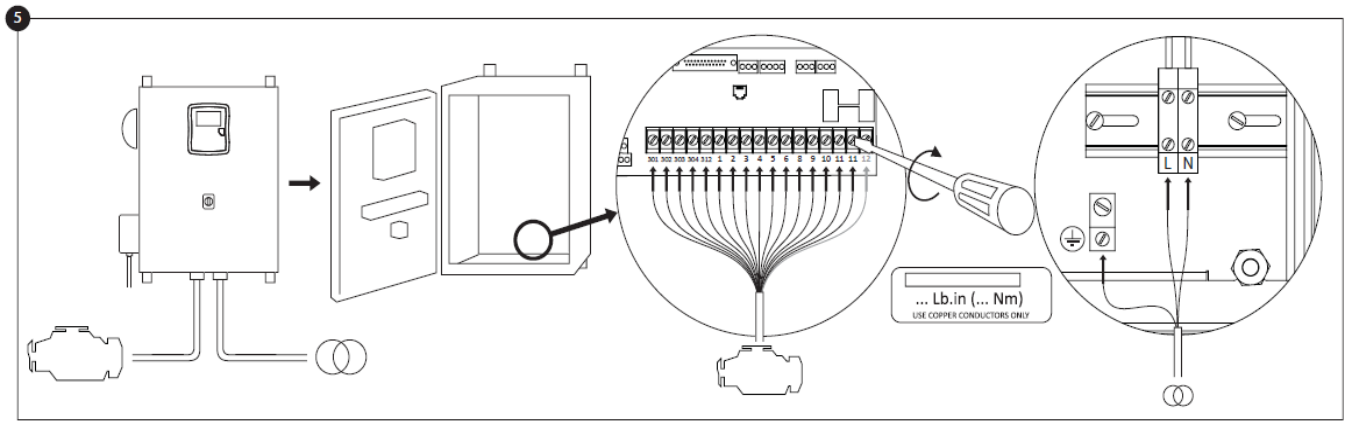
Quick Start-Up Guide



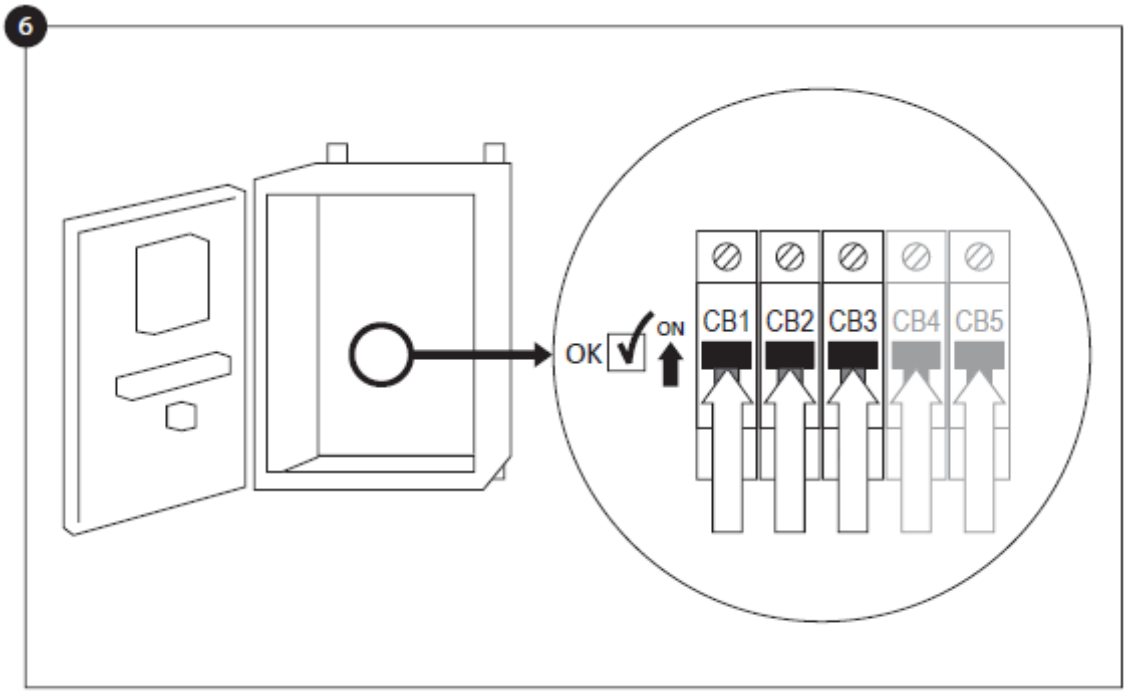
The rating label is the most important label. It must be read carefully to ensure the compatibility between the controller and the installation.



Open the controller's door and verify all circuit breakers are in the lower "OFF" position.



Connect all cables between the engine control panel and the controller engine terminals (Identified as “U” on the IO board diagram displayed in the Terminal Strips Descriptions in the manual). Secure with the appropriate torque as indicated on the torque label and verify all connections. Connect the AC main line and ground to the AC terminal in the controller.

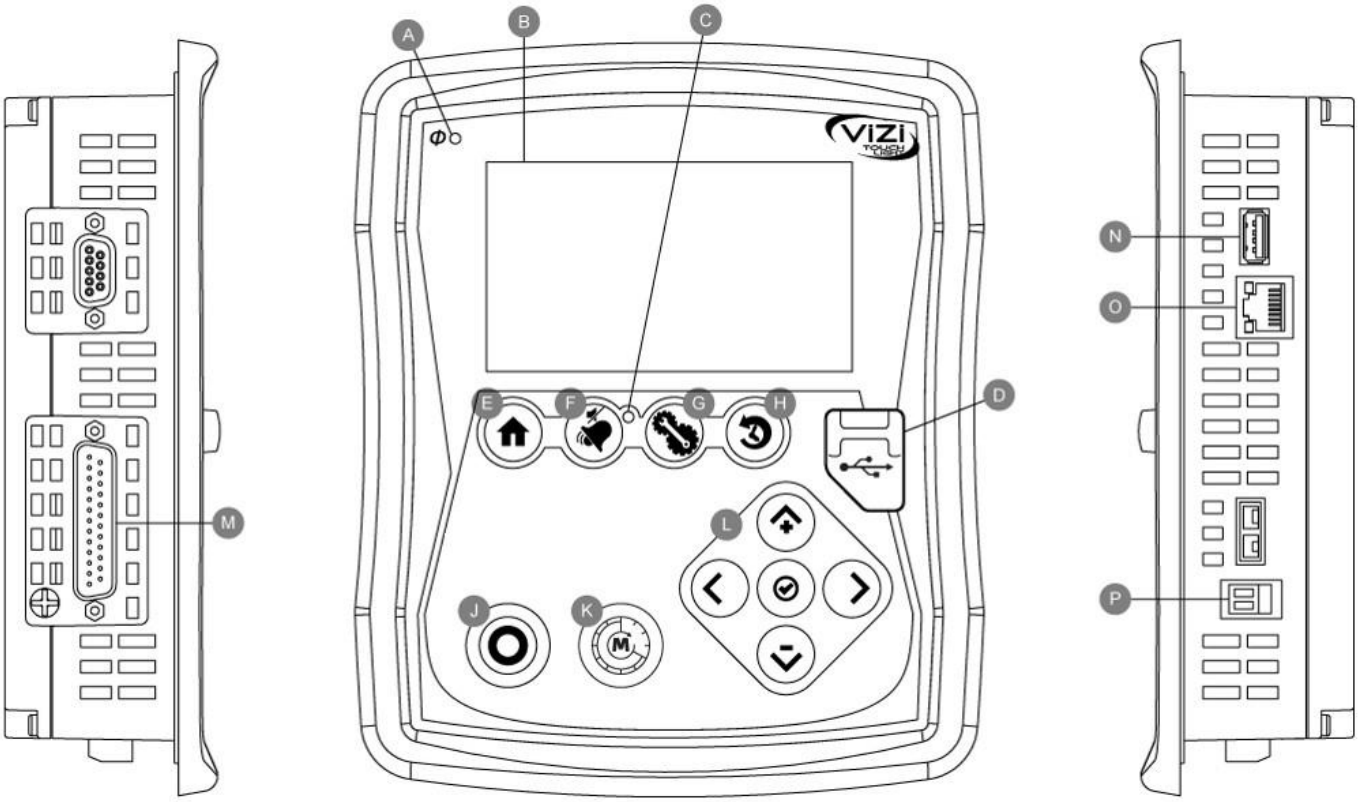


Activate the disconnect switch (if present) and all breakers by setting them to the "on" position. The controller will boot up for the first time.

Before trying to start the engine, verify that the engine setup is complete and the exhaust pipe is connected properly. Verify that the engine has started and is running properly.

Main Features 3

The ViZiTouch



A: Power LED: Indicates if the ViZiTouch is properly powered.
B: Touch Screen: 4.2 inches color touch screen LCD.
C: Alarm LED: Indicates if an alarm is currently active.
D: Front USB Connector: USB Device connector used for file download, software updates, service reports.
E: Home button: Used to navigate to the Home page.
F: Alarm button: Used to navigate to the Alarm page. It also allows the user to silence the alarm bell, hence the small “no speaker” symbol in the upper right corner of the button.
G: Config button: Used to navigate to the Configuration page.
H: History button: Used to navigate to the History page.
J: Stop button: Used to stop the engine if all starting conditions are gone.
K: OPERATE START TEST PUSH BUTTON: The engine can be started by using this pushbutton after a “Fail to Start” alarm or after an automatic start followed by a stop. This method of starting will activate the last cranking starter that did not attempt to crank.
L: Contextual navigation pad: Used to facilitate the navigation on specific pages. A small icon representing the contextual navigation pad will appear at the bottom right corner of a page if the pad is active. By clicking on the small pad icon, a menu explaining the specific functions of the arrows will appear. For example, it is possible to switch between the graphical or the table mode on the logs page, as well as navigate through the tables.
M: CAN bus connector to IO cards
N: USB 2.0 connector
O: Ethernet connector
P: Alarm Bell connector

Warning
After 2 years of service, the Vizitouch battery may become less efficient and could lose the time after a shutdown.

Alarm Bell

The alarm bell is activated under default faulty conditions and under optional or user defined conditions.
Any of these conditions will energize the alarm bell but may be silenced, by pressing on the “Alarms / Silence” membrane button. When silenced, the alarm bell restarts ringing if a new fault occurs or if the alarm conditions remain unchanged after 24 hours. The alarm bell automatically stops ringing if alarm conditions are not present anymore.
Note: other external conditions may trigger optional conditions depending of the factory settings. Verify drawings affixed inside the cabinet.

Default Conditions :
- Engine Overspeed
- Engine Low Oil Pressure
- Engine High Coolant Temperature
- Engine Fail to Start
- Battery Failure 1-2
- DC Failure
- AC Fail
- I/O Cards Communication Loss
- CAN System Failure
- File System Failure

Chargers

Every LFD control panel is equipped with two battery chargers, one for each battery. Their role is to maintain the batteries voltage to a full charge level.

Battery switching

When an automatic start request is triggered, a cranking sequence is launched by the control panel. The automatic starting sequence will make up to six attempts to start the engine by cranking the engine starter. The control panel will alternate automatically between the two batteries after each cranking attempt. Each attempt will be of 15 seconds and separated by a 10 second pause. If after a cranking attempt, the motor did not reach 120 RPM, the battery will be declared weak and all the remaining attempts will be made from the other battery. After the six attempts, if the control panel doesn’t read an engine speed, the “Fail to Start” alarm will be triggered.

WARNING!
Do not under any circumstance use the batteries for any purpose other than for motor start-up.

Monitoring and Surveillance

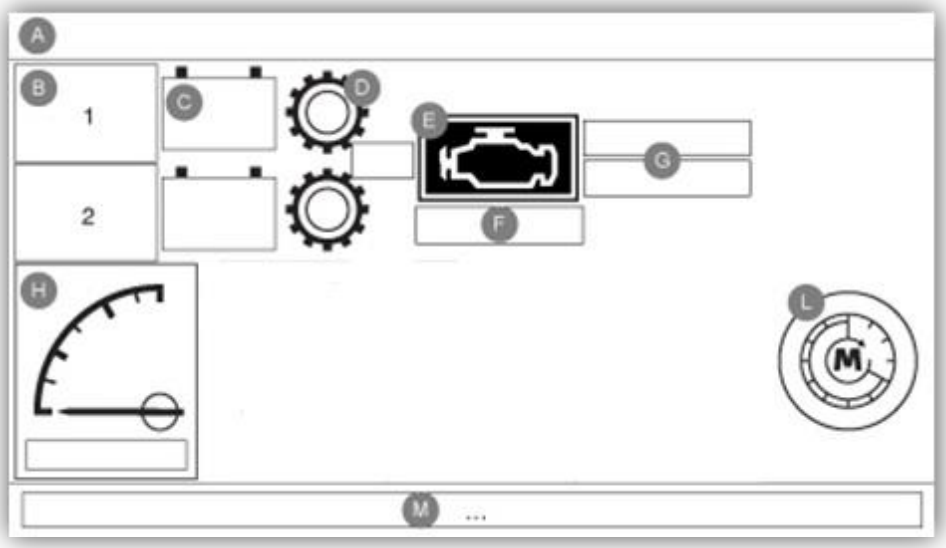
Monitoring and surveillance is done using speed sensor, pressure switch and signals from the engine. A speed sensor sends a signal to the IO board which is translated into the engine speed. A pair of pressure switch is used to monitor the pressure switch on the sprinkler system and trigger the automatic starting sequence. The control panel also uses signals from the engine to monitor different parameter that trigger alarms such as “Low Oil Pressure”, “High Engine temperature” and “Low Temperature”.

Fan and Louvers

The Fan and Louvers are activated upon activation of the engine run signal. They should be wire to the TB2 relay, the fan on the Normally Opened contact (11-14) and the louvers on the Normally Closed contact (11-12).

Home 4

Home (Membrane button) **Home**



The home page displays all controller statuses and important values of the controller. All voltages, currents, engine state and status, as well as all timers and cranking sequences.

The entire background will become red if an alarm becomes active. This feature will help the user identify a problem even at a significant distance away from the controller.

A: Navigation bar which contains general information about:
- The language (the language may be changed by pressing on it)
- The page title
- The alarm banner (warning and alarm messages may be shown)
- The date and time (adjustable in the Configuration page)

B: Battery charger state. It may become one of three colors and also explicitly describes the current battery charger state.
POWER UP – Green
BULK – Green
OVER_CHARGE – Green
FLOAT – Green
CHARGER_FAIL – Red
NO_AC – Red
BATTERY_FAIL – Green

An orange rectangle between the battery and the charger will appear periodically. It is the boost mode. This charging mode enables the boost function on the charger, allowing a shorter charging time of the battery. Also, it allows the controller to detect a missing battery, and/or a problem with the charger.

C: Battery. The battery will be red if it is in failure and green otherwise. The first line of data shows the actual voltage of the battery in volts and the second line shows the actual current in amperage.

D: Starter gear. It represents the current state of the cranking sequence. The cranking sequence is made of 6 cranking attempt of 15 second separated by pauses of 10 second. The counter inside the gear indicates the remaining time of the current state. As there are two cranking modes, “waiting for crank” and “cranking”, the gear

will alternate between yellow (waiting) and green (cranking), allowing the user to know exactly the state of the cranking sequence.

E: State / Timer. During a cranking sequence, a counter will be visible between the two contactors. This counter indicates the state (1 to 6) of the cranking attempt inside the cranking sequence. It will stay on a state for 15 seconds of cranking, if it's not interrupted, and for 10 seconds of pause. Then, it will continue counting until the end of the sixth cranking attempt, which is the end of the cranking sequence. When the "Energize to Stop" fuel solenoid valve is activated, a timer appears in this box. This timer can be canceled by pressing the red cross above the timer.

F: Fuel solenoid. In this box, the user can see the state of the fuel solenoid. A red symbol represent the activation of the "Energize to Stop" fuel solenoid valve. This activation will stop the engine.

G: Diesel engine. It will be grey if the engine is stopped, green if an "Engine Run" signal is detected and red if an "Overspeed" or "Fail to start" occurred, after 6 unsuccessful cranking attempts. The engine will be yellow if running in test mode.

H: Time in use. This timer shows the amount of time the motor have been running.

I: Starting or stopping cause.

A green capsule will indicate the reason why the engine is running. Possible choices are:
LOCAL – Optional: This start cause is triggered if the engine is locally started directly from its own control panel and the option is enabled.
EMERGENCY – It receives a manual crank request from the emergency pushbutton.
DELUGE: Automatic engine starting activated by a deluge valve.
REMOTE AUTO: Automatic motor starting activated by remote equipment.

A red capsule will indicate the reason why the motor is not running despite the fact that a request is being made. Possible causes are:
FAILSTART – This failure happens when the controller receives a request to start, but a "Fail To Start" alarm is active after a cranking sequence failure, thus preventing its ability to effectively start the engine until this alarm is reset.
LOCKED: An interlock signal is preventing the motor from running.
AUTO MODE BYPASS: If Automatic/Off pushbutton inside the enclosure door is press, the AUTO MODE BYPASS ALARM will be activated. It will stop the engine if it was running, and will prevent starting from automatic causes, therefore ideal for maintenance and/or services. Deactivation is done by pushing the Automatic/Off pushbutton again, this will reset the alarm.

J: Pump on Demand: This green box will appear when an automatic start demand is activated.

K: Motor speed gauge: The first small green line and small red line on the gradations shows the Set point of the "Engine Run" Signal. When the engine runs with a speed above this threshold, the ViZiTouch will consider it is running, and when it slows down under the red line, it will be considered stopped. The second red line, usually set high on the gauge, represents the "Overspeed" threshold. If the engine speed reaches that mark, the "Overspeed" alarm will be activated. Please refer to chapter 6 for more information.

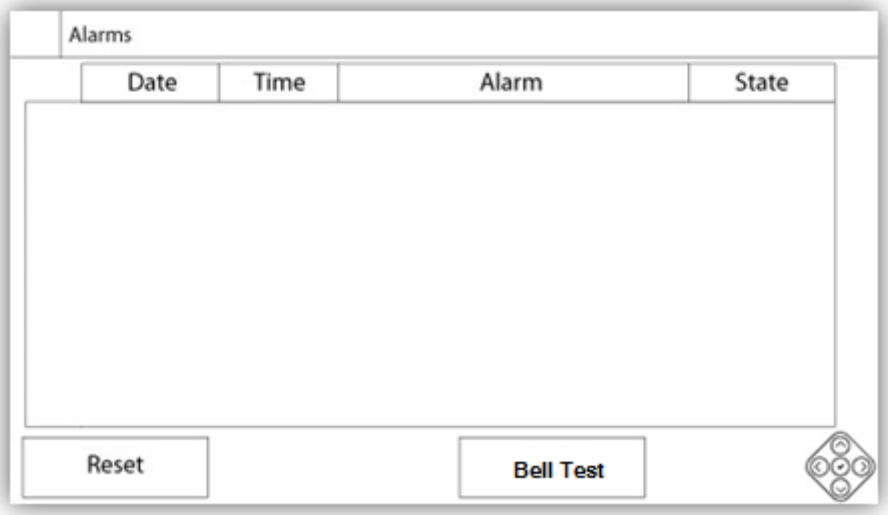
L,M: The "M" section shows the text: "OPERATE MANUAL START TEST PUSH BUTTON IF LIGHT IS LIT". It is grey when the corresponding button is offline. When the button becomes active, the message color turns Yellow, and the button's logo appear on screen ("L"), sending the message that the controller is ready for this test.

Screen Saver

After 5 minutes of inactivity on the ViZiTouch, the screen will dim it's brightness to 25%. After 10 minutes of inactivity on the ViziTouch, the "Black Screen" screen saver will activate. Its goal is to expand the lifetime of the LCD screen. The screen saver will be instantly deactivated if the engine is running or if an alarm is activated. To manually deactivate it, simply touch the screen or any membrane button. After deactivation, the screen saver will always redirect to the "Home" page. It will also log off any user by resetting the security level to 0 and save any new modifications to the settings.

Alarms 5

Alarms (Membrane button) **Alarms**



Displays the list of currently active and occurred alarms. An alarm is called ACTIVE when its triggering condition is present. An alarm is called OCCURED when its triggering condition has been active, but is no longer true. Alarms representing serious concerns are RED. Alarms representing simple warnings are YELLOW. To silence the bell press the ALARM button or it will silence itself after the expiration of a factory set timer. Pressing on the RESET button will reset OCCURED alarms only.

The “Bell Test” button will activate the alarm bell for 3 seconds.

The table displays system events:

- Date and Time: Date and time stamp of the alarm in the YYYY.MM.DD format
- Message: Alarm message
- State: OCCURED or ACTIVE
- Color Code:
    - Red: The event is an alarm
    - Yellow: The event is a warning

Complete list of alarms :

Common Alarms:

Engine Trouble: The Engine Trouble common alarm is active when one or more of these conditions are active :
- Engine High Temperature
- Engine Low Temperature
- Engine Low Oil Pressure
- Engine Fail to Start
- Engine Fail when running
- Engine Overspeed
- Battery Failure 1-2
- Loss of continuity with contactor 1-2
- Pump Failed

Pump Room Trouble: A common alarm activated when the following events occur:
- Fuel Tank Leak
- Low Fuel Level
- High Fuel Level
- AC Failure
- Water Reservoir Low
- Water Reservoir High
- Water Reservoir Empty

CTRL Trouble: Important: this relay is normally energized when controller is in normal condition. The relay is de-energized when controller trouble is detected (fail safe). The controller trouble common alarm is active when one or more of these conditions are active :
- Charger Failure 1 OR 2
- Battery 1 AND 2 Failure

Common Trouble: This Global Common Alarm is activated if one of these alarms are active:
- Engine Trouble
- Pump Room Trouble
- CTRL Trouble

- AC Failure: Monitors the AC power and activates on a failure.

- Battery 1-2 Fail: Monitors the status of battery 1 and activates on a failure. This occurs when the battery is disconnected, is the wrong type or is unable to be recharged. When disconnecting a battery, there will be a delay before the alarm is activated. The boost signal will be active a minute later, or more if a ghost current is detected. If there is no response from the battery, it will execute a second test 30 seconds later, and then activate the battery failure alarm.

- Charger 1-2 Fail: Monitors the state of battery charger 1 and activates on a failure. This occurs when the battery charger has a defect, is not properly powered, or is unable to provide the needed current. It will also change to Boost Fault mode if during a boost test, the voltage does not rise. A NC dry contact is also connected from the charger to the IO Board. If this contact opens for 1 minute, the alarm will be activated. Chargers readings are not updated during cranking and/or running, due to reading instability under load. As soon as the engine returns to an idle state, all readings and failure analysis are reactivated.
(Note: With the option NiCad batteries, no boost is used and there is no NC dry contact. The "Charger Fail" alarm is detected when the battery voltage goes under the float voltage and no current is detected between the charger and the battery.)

- Loss of Continuity 1-2: Activates if the engine start contactors are disconnected from the controller.

- Water Res. Low (option): Activates if the “Water Reservoir Low” contact input is triggered or if the analog readout of the water reservoir is enabled and is lower than the water reservoir low set point in the “Water Level” sensor page.

- Water Res. Empty (option): Activates if an external contact triggers the optional “Water Reservoir Empty” input.

- Main Relief Valve Open (option): Activates if an external contact triggers the optional “Main Relief Valve Open” input.

- Fuel Tank Leak (option): Activates if the “Fuel Tank Leak” optional contact input is triggered.

- Low Fuel Level: Activates if the “Low Fuel Level” contact input is triggered or if the optional analog readout of the fuel level is enabled and goes lower than the low fuel level set point in the “Fuel Level” sensor page.

- High Fuel Level (option): Activates if the optional “High Fuel Level” contact input is triggered or if the analog readout of the fuel level is enabled and goes higher than the high fuel level set point in the “Fuel Level” sensor page.

- Engine Fail When Running: Activates if the “Engine Run” signal is lost while the engine is running.

- Engine Fail to Start: Activates if the engine fail to start after completing a 6 attempts crank sequence. The engine will turn red.

- Engine High Temperature: Activates if the specific “High Temp” input (5) is triggered on the engine connector strip and the engine is running.

- Engine Low Temperature: Activates if the specific “Low Temp” input (15) is triggered on the engine connector strip.

- Engine Low Oil Pressure: Activates if the specific “Low Oil Pressure” input (4) is triggered on the engine connector strip and the engine is running.

- Engine Overspeed: Activates if the speed read is higher than the set Overspeed value.

- Io_expX-inX alarm (option): Activates if the specific expansion programmable input on the specific expansion board is activated and triggered.

- Battery1-2 Overvoltage: Activates if the voltage of the specific battery is higher than the specified overvoltage set point.

- IO Diesel Communication Error: Activates if no communication with the diesel IO board could be established for 15 seconds. If this alarm persists for more than 1 minute the controller will reboot to try to fix the problem.

- IO Expansion Communication Error (option): Activates if no communication with the Expansion IO board could be established for 15 seconds.

- Communication System Failure: Activates when the communication task has stopped responding. This alarm condition is critical and will be followed by a controller reboot to try and fix the problem.

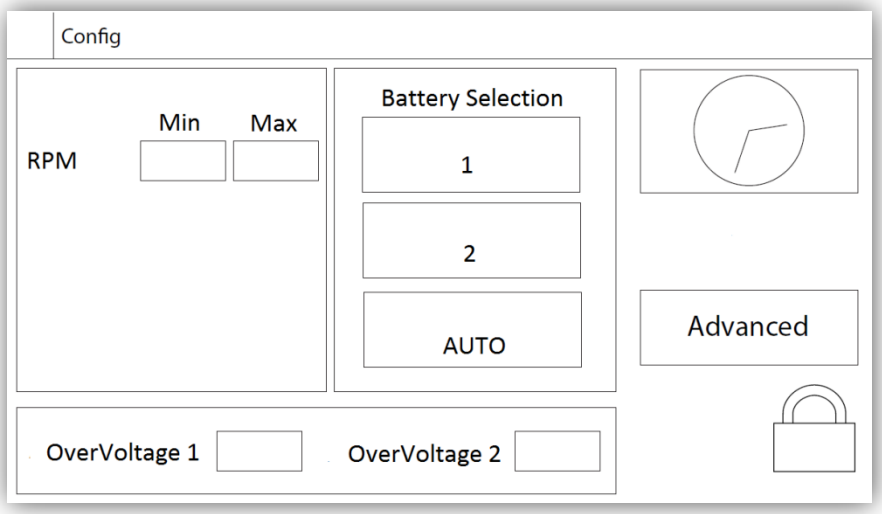
- Pump Failed: A pressure switch needs to be installed at the pump exit for this alarm to be meanningfull. The pressure switch close if the pressure is high enought and open otherwise. If the pump is running and the pressure switch is still open 5 seconds after having engine run, this alarm will be triggered.

- Emergency Start Activated: Activates when the Emergency Start push button is pressed.

- Engine Run: Activates when the engine is running.

Configuration 6

Config (Membrane button) **Config**



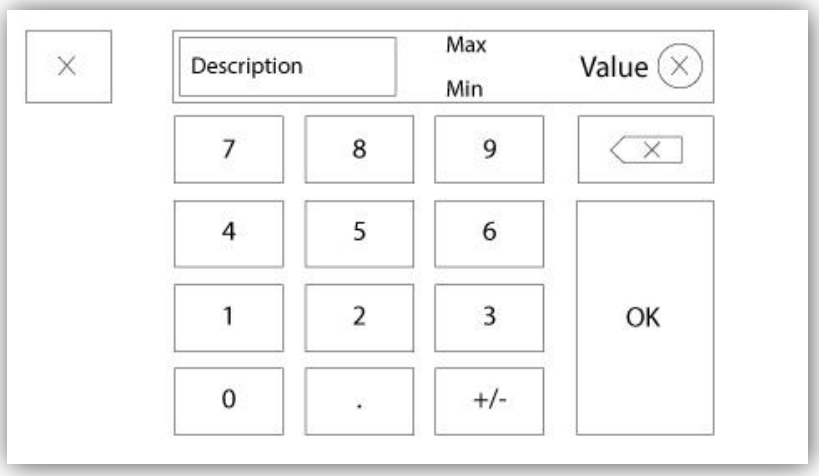
Setup all basic configuration parameters.

The main configuration page provides a quick means of changing the most common settings. The padlock icon indicates the current authorization level. A locked padlock indicates that only basic settings can be changed. Press on the padlock to enter an authorization code to unlock additional settings. An unlocked padlock showing an authorization number indicates that some settings are unlocked. Press on the padlock again when you have concluded your operation.

Access Level 0:
- The “Advanced” button activates the advanced configuration pages.
- Date and Time adjustment are accessed by pressing the clock. Refer to the “Date and Time” page for more information.

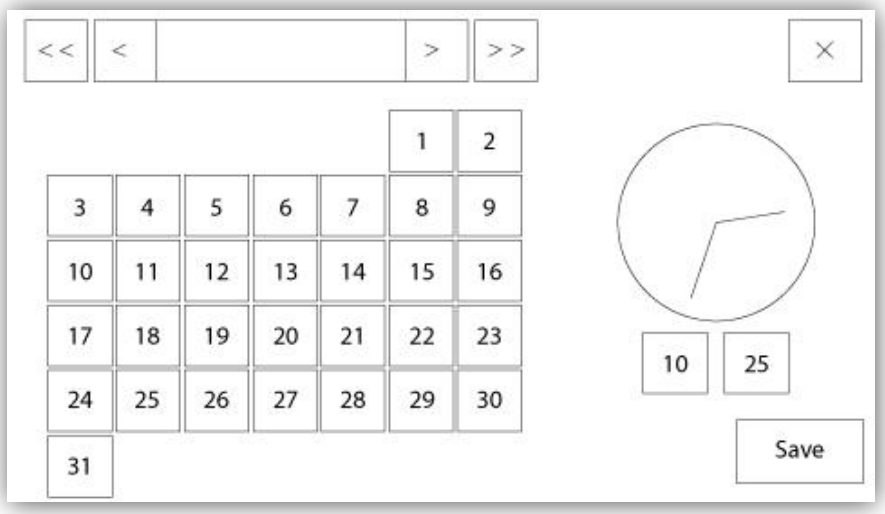
Access Level 1:
Inside the left box, the engine speed parameters can be set. Adjustment of the Minimum and the Maximum of the speed gauge displayed on the Homepage.
Inside the middle box, a battery selection can be made. This setting should always be “AUTO”, unless if doing maintenance on one battery or for testing purposes.
Inside the lower box, two “overvoltage” set points can be adjusted to trigger battery Overvoltage alarms.

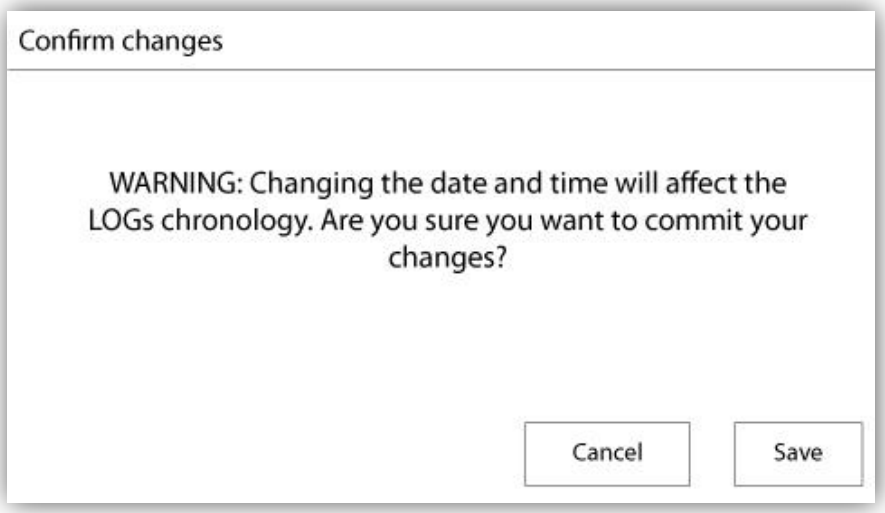
NumPad Page



The NumPad is activated every time the user clicks on a white square box representing a number that can be set. On top of the NumPad, the current parameter is shown. The text will flash red if the value entered is invalid and the OK button will be black, indicating that the value is out of range. The MIN and MAX show the range of values accepted for that particular parameter. The “X” button allows the user to cancel editing the value. The back arrow erases the last entered number and the “CA” button clears the whole text field. Simply click the “OK” button once the value is set.

Date and Time Page





The Date and Time can be configured by selecting the current month and year by pressing the arrow buttons on each side of the “Month-Year” display and selecting the day of the month by selecting the actual day. The time is set by pressing the two square boxes under the clock; the left sets the hours and the right sets the minutes. Press the Save button to commit the changes. A dialog box will appear to confirm the change “Date and Time”. The user may cancel the changes by pressing the “Cancel” button. Please note that changing the date and time will have an effect on the logs chronology.

User Login Page / KeyPad Page

User Login KeyPad:
This page allows the user to log into a higher security level by entering a password. If the password is valid the text field will turn green and if it is invalid, the text field will turn red. A "X" button appears in the text field as soon as a character is entered, allowing for a quick erase of the written password.

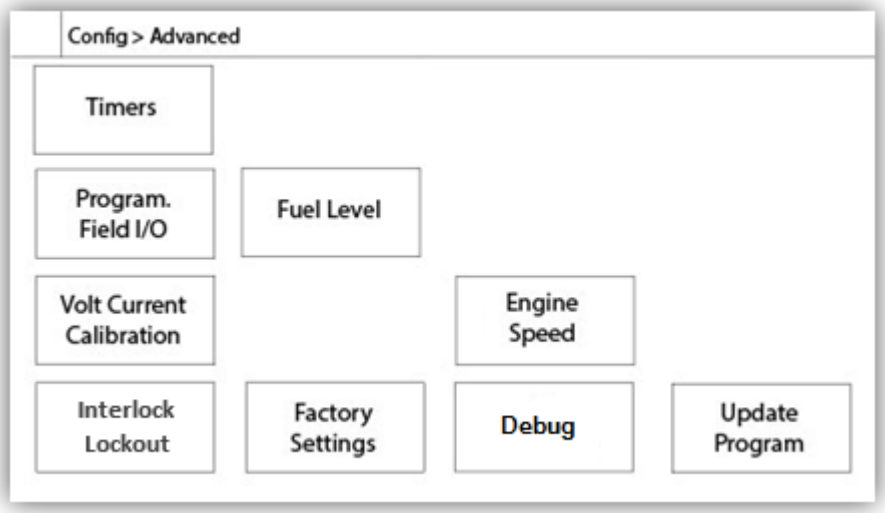
If the password is invalid for a consecutive number of times, the user will be redirected to the "Service Dealer" page, allowing the user to communicate with the appropriate Service Dealer.

If the password is valid, the "Configuration" page will reload and the access security level will be shown inside the lock. To log off, click on the lock and the user security level will return to "0"

Other KeyPads:
The KeyPad is activated every time the user clicks on a grey rectangle box with white text representing a text that can be set. The "X" button allows the user to cancel editing the value. The back arrow erases the last entered

character and the "CA" button clears the whole text field. Simply click the "OK" button once the value is set. This type of text field is mostly used to generate a digital text indication for a custom alarm input.

Advanced Configuration Page **Config > Advanced**



This page is the portal to all the advanced configuration parameters of the ViZiTouch.

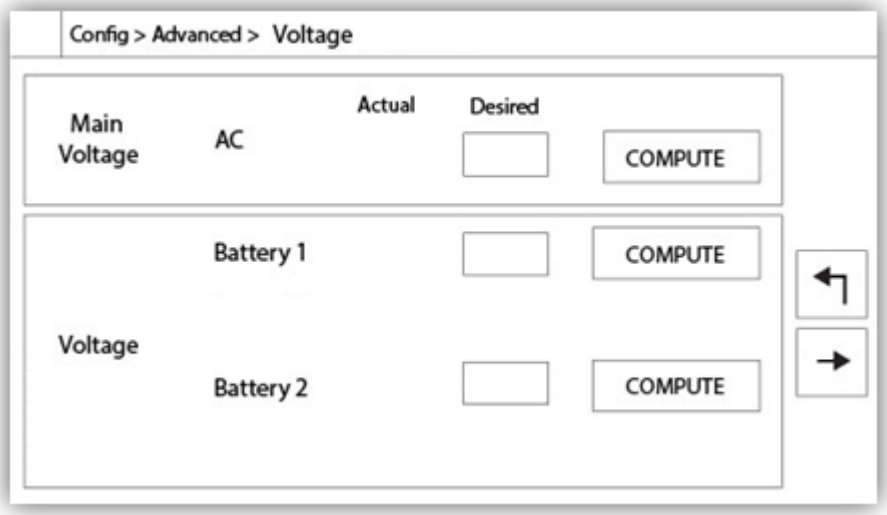
All timers, sensors, factory settings, software update, service dealer and debug pages may be accessed simply by clicking on the appropriate buttons.

Since two of the analog inputs are using the same physical connector, only one of these can be installed at once. These analog inputs are shown in the grey box surrounded by a black dotted line. Each time one of these sensors is installed, the other will turn orange, preventing the dual installation of these sensors.

All buttons are set to security "Level 0" except "Update Program" which is set at "Level 1" security.

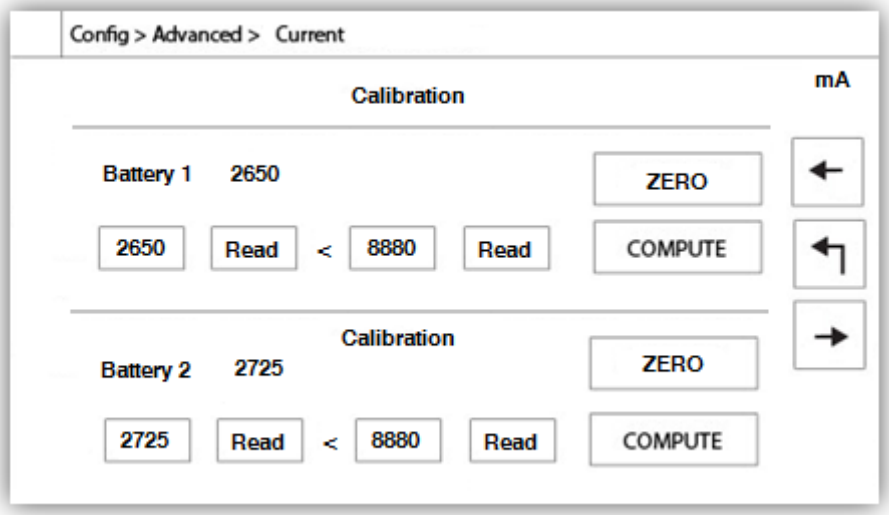
Details of the Advanced Configuration Page

Volt-Current Calibration **Config > Advanced > Calibration Voltage-Current**

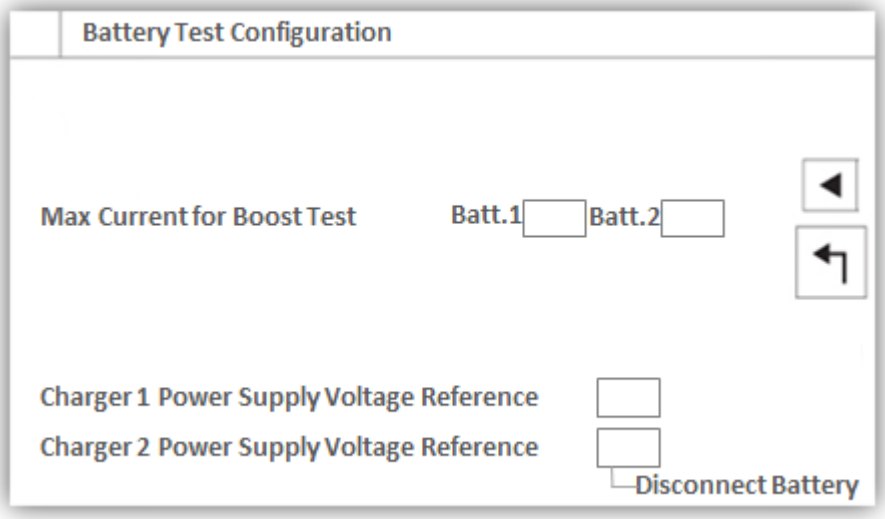


This page is used to calibrate all analog voltages. The actual column shows the actual value calculated by the ViZiTouch. The “desired” column allows a level 2 user to enter the desired value read from a calibrated external device (multimeter). For the AC voltage and the 2 DC voltage, the calibration is done by entering the desired value and pressing on the “COMPUTE” buttons. The DC values must be entered with no batteries connected, to allow the

calibration of the battery chargers in the “power supply” mode. To do so, simply turn the batteries circuit breaker to OFF.



This page is used to calibrate all analog currents. The first number right beside the Battery 1 and Battery 2 text shows the actual current reading. First, Set the CB3 Breaker in the OFF position. This will disconnect the battery. Press the ZERO button. Then, put the CB3 breaker back in the ON position. Connect a small charge to the 6 and 11 terminals, to create a low current around 2600 mA. Enter this value in the most left field of battery 1, and press the Read button. Then, connect a bigger charge to the 6 and 11 terminals, around 8800 mA. Write the measured value in the second text field, and press the second read button. Finally, press the COMPUTE button to complete the calibration. Repeat for the second battery, linked to CB4 Breaker and terminals 8 and 11.

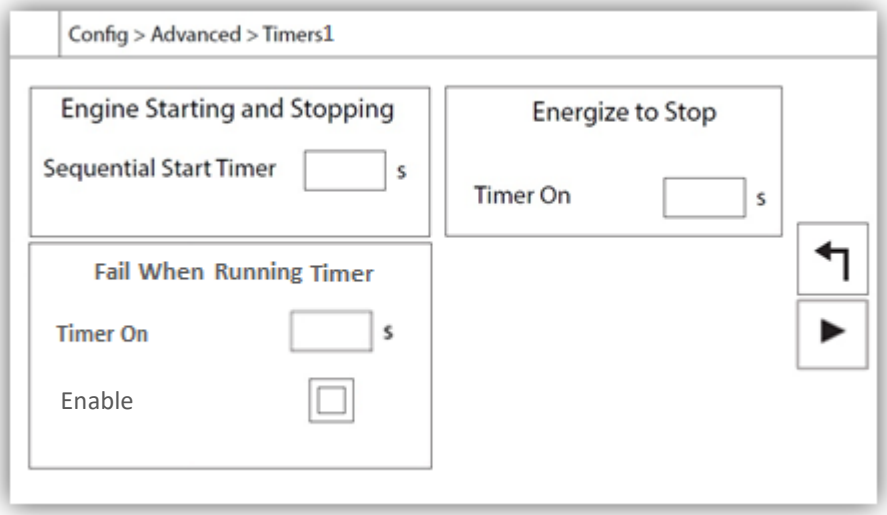


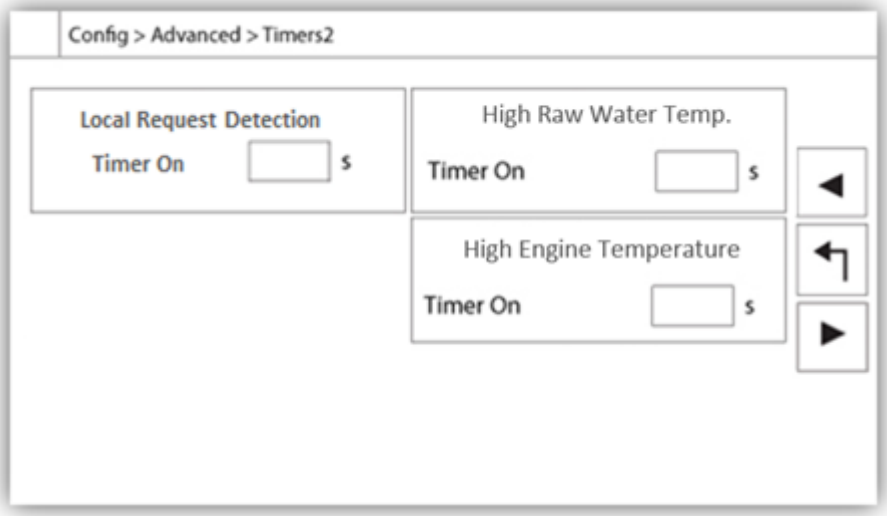
This page is used to adjust the calibration of the battery test.

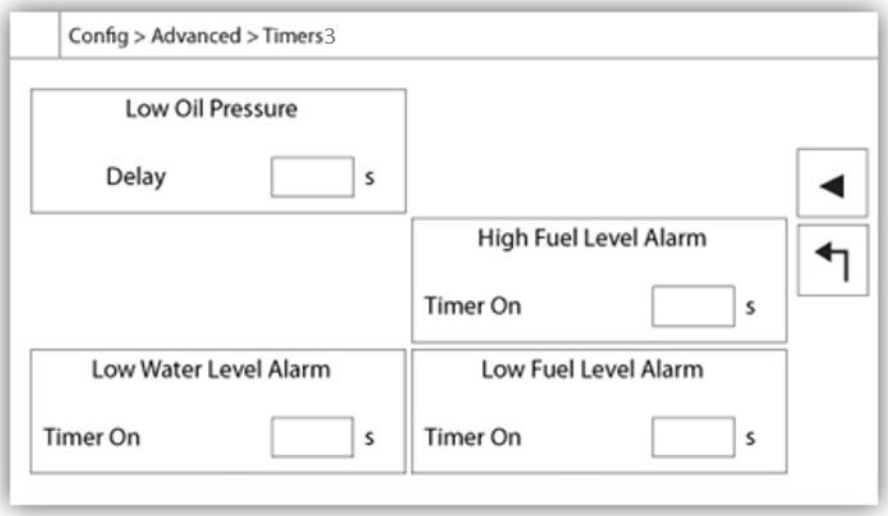
Max Current for Boost Test : Under this current value in Amps, no test on the battery is made. (Note: With the NiCad batteries option, this field is not available)

Charger 1-2 Power Supply Voltage Reference : This is the voltage that is applied by the battery charger in power supply mode (no battery connected). To measure this voltage, the battery must be disconnected.

Timers Page **Config > Advanced > Timers1-2**







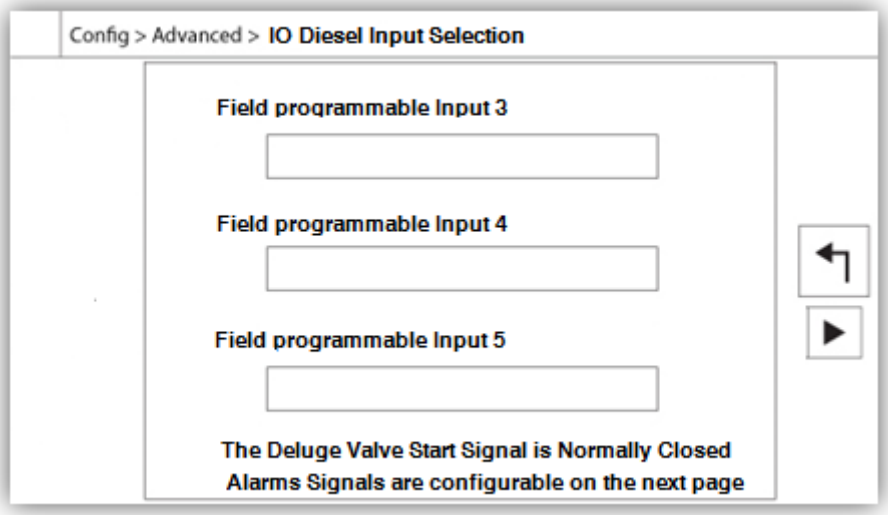
Most common timers for fire pump control can be configured here. Note that any timer set to 0 will remove the delay in the decision process.

Access level 1:

- Engine starting and stopping:
The “Sequential Start Timer” allows a delayed response on an automatic start request.
- Energize to Stop:
This timer set the time in second the fuel solenoide valve will close after a stop.
- Fail When Running Timer:
If Enabled, this timer will delay the "Fail When Running Alarm".
- Local Request Detection:
This is the delay it will take to the controller to detect a Local start of the pump.

The other timers are self explanatory and set the time delay on alarms.

Inputs/Outputs Configuration **Config > Advanced > IO Diesel Input Selection - Config - Output Config**



This page, if logged in, allows the re-assignation of 3 programmable inputs by pressing on the signal name. If the Deluge Valve signal is selected, it will be assigned as a normally closed input. Proceed with caution as this may cause the engine to start. If an alarm signal is chosen, it can be configured on the next page (Enabled, NO/NC, Audible, Importance (Alarm or Warning). The available signals are:

- Low Fuel Level, High Fuel Level, Fuel Tank Leak

- Water Reservoir Empty, Water Reservoir Low, Water Reservoir High

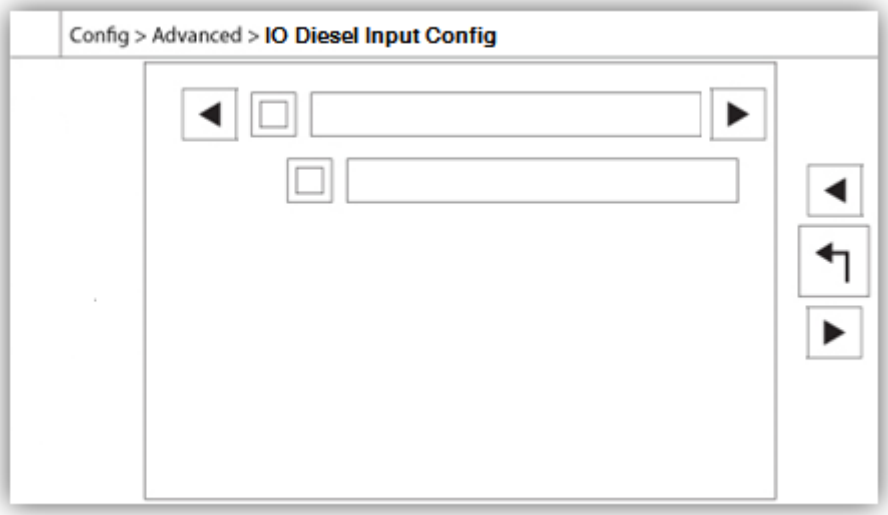
- Flow Meter ON, Main Relief Valve Open

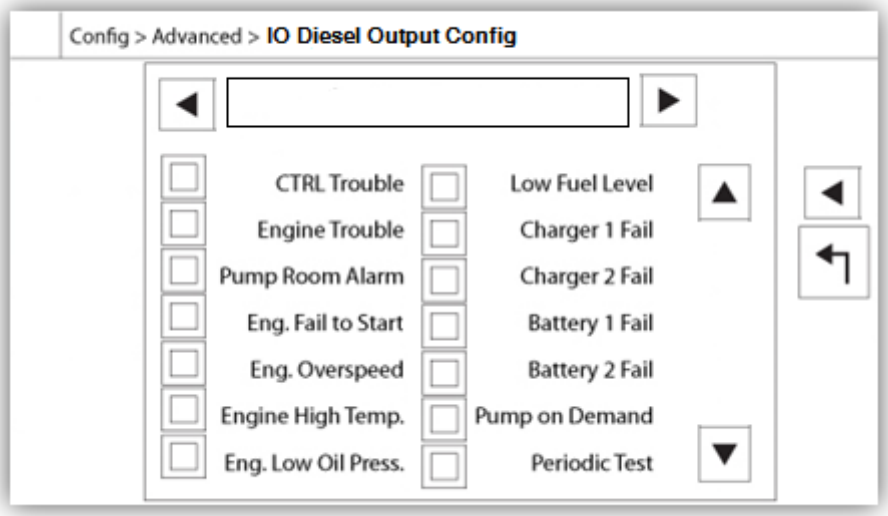
- Low Suction Pressure

- Lockout

- Remote Manual Start

- Deluge Valve Start (NC)

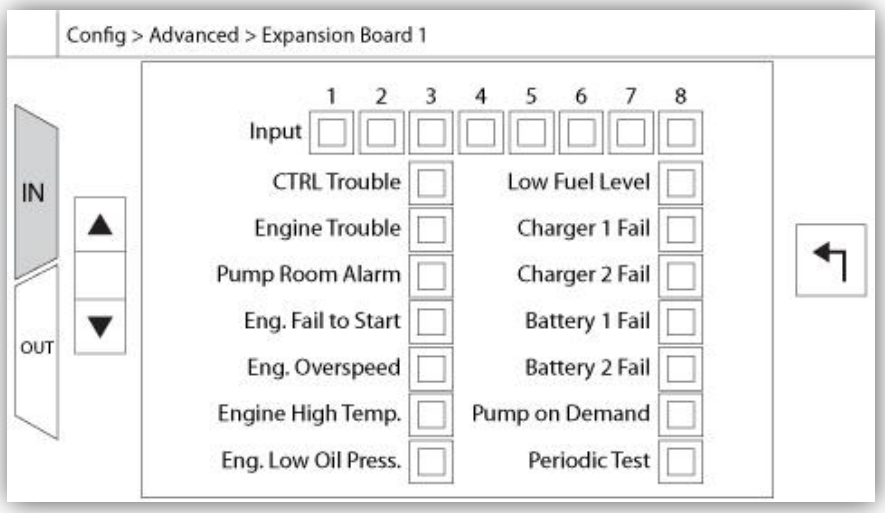


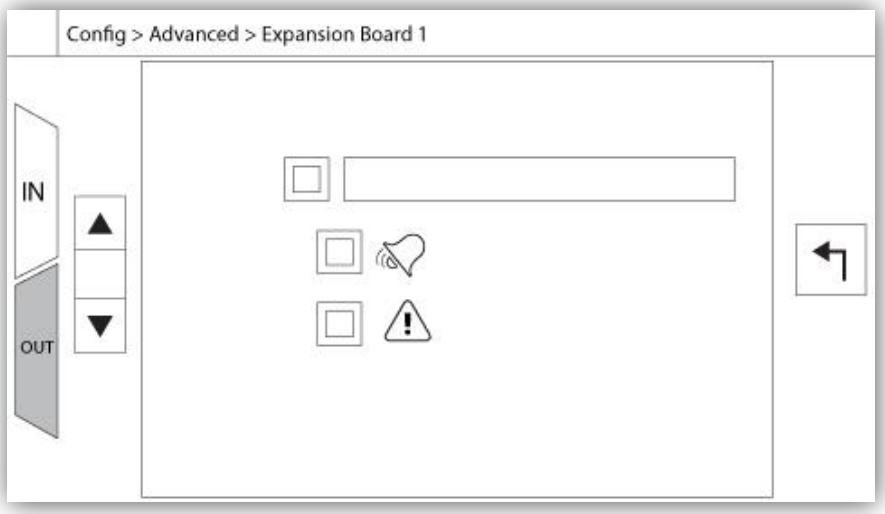


This page allows the configuration of alarm signals on the inputs, and outputs relay signals. Two buttons located far right navigates between the input and output section of the page.

Input:
The input page has four elements: The NO/NC setting, the “Digital Text Indication” field, the “Alarm Bell Icon” and the “Alarm Icon”. Each one can be enabled or disabled. The first step is to click on the square button beside the text field to activate the management of the input signal. If the “Alarm Bell Icon” is enabled, the input signal will trigger the Alarm Bell. If the “Alarm Icon” is enabled, the input signal will be treated as an alarm, if not, as a warning. As on the output page, the buttons at the top allow for an easy navigation between all available inputs of the diesel board.

Output:
The configuration is performed by pressing on the square box located beside one of the signal needed. The box will swap between BLANK (none), a NO (normally open) and a NC (normally close) symbol, allowing the desired configuration to be obtained. The final state of the output signal is a logical “OR” combination of all selected signal.





This page allows the configuration of both programmable inputs and outputs available on an IO Expansion board. Two buttons located far right navigates between the input and output section of the page.

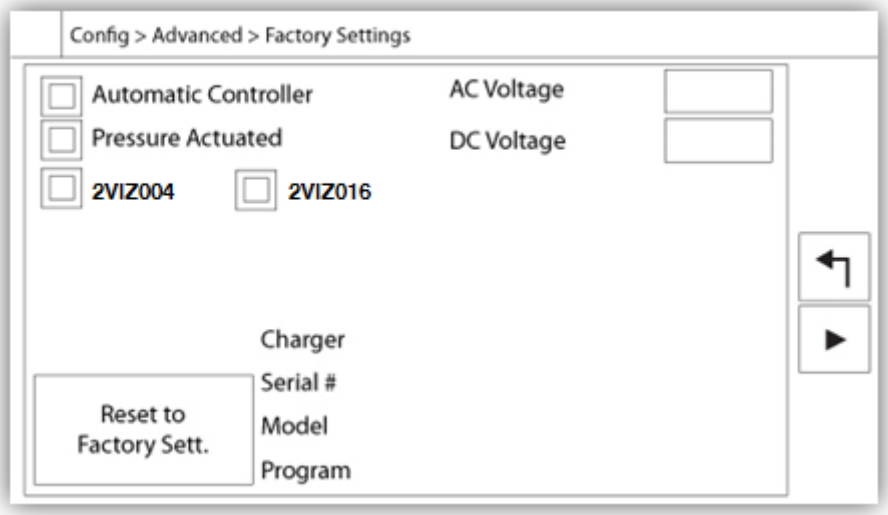
Input:
The input page has four elements: The NO/NC setting, the "Digital Text Indication" field, the "Alarm Bell Icon" and the "Alarm Icon". Each one can be Enabled or disabled. The first step is to click on the square button beside the text field to activate the management of the input signal. If the "Alarm Bell Icon" is Enabled, the input signal will trigger the Alarm Bell. If the "Alarm Icon" is Enabled, the input signal will be treated as an alarm, if not, as a warning. As on the output page, the buttons at the top allow for an easy navigation between all available inputs of the diesel board.

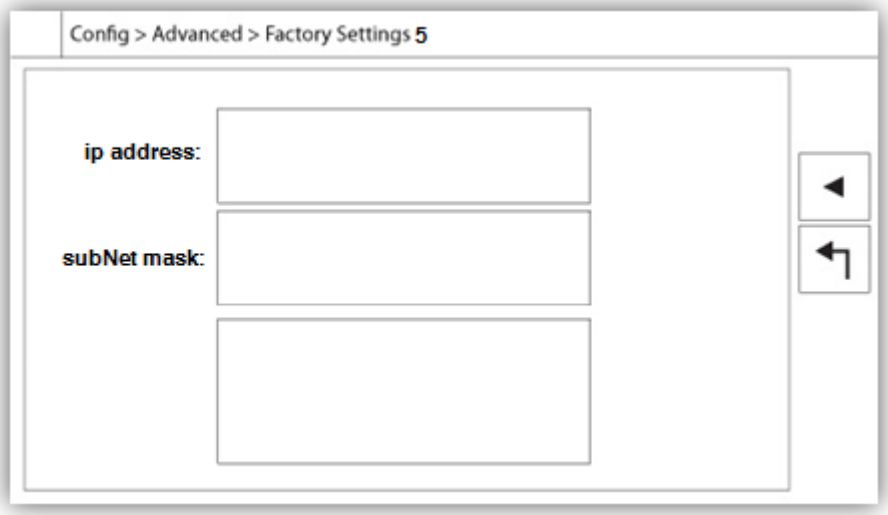
Output:
The configuration is performed by pressing on the square box located beside one of the signal needed. The box will swap between BLANK (none), a NO (normally open) and a NC (normally close) symbol, allowing the desired configuration to be obtained. On top of all outputs signals available, it is possible to link in the same way the expansion board inputs to the selected output in any combination. The final state of the output signal is a logical "OR" combination of all selected signal.

Update Program Page

This procedure is highly important and must be attempted with care. Please make sure to contact the factory prior to using the Update Software function.

Factory Settings **Config > Advanced > Factory Settings**





This page is only avalable if one or more Expansion Board is installed as an option.

The factory settings are always pre-configured at the factory and set the main parameters of the controller.

Left Section:

Automatic Controller – Non-Automatic Controller: An automatic controller will respond to automatic start requests, like a pressure drop announced by a pressure transducer or a pressure switch, a deluge valve signal or a remote automatic start trigger. A non-automatic controller will only start the engine on manual requests.

2VIZ004 – 2VIZ016: These refer to older version of the IO Diesel Board. If the controller hosts one of these version, the corresponding check box must be activated.

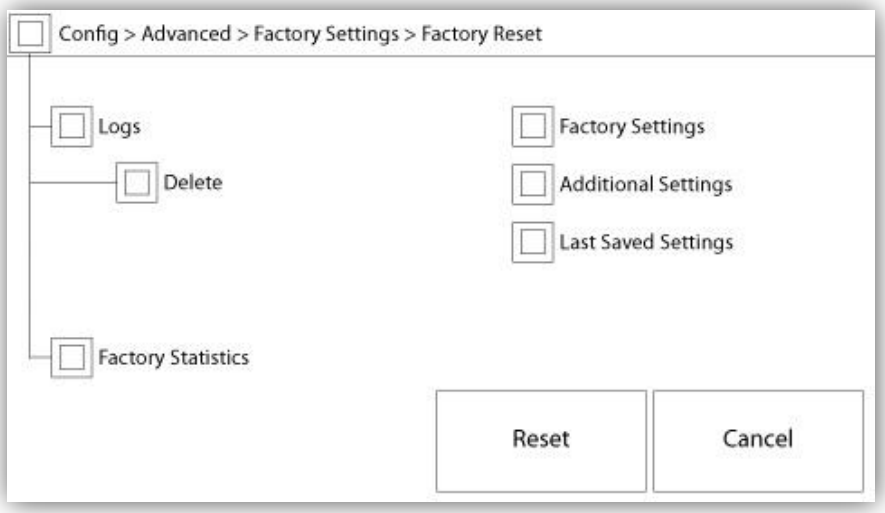
“Reset to Factory Settings”: This button redirects to the “Reset to Factory Settings” page. This is a major operation that must be used with care and only if the factory was contacted first. See the “Reset to Factory Settings” help for more details.

Right Section:

The first two settings set the nominal AC and DC voltage for the controller.

Technical information about the controller: Serial Number, Battery Charger Type, Model Name and Software Revision.

Reset to Factory Settings Page



This page will reset the ViZiTouch to the original factory configuration, thus clearing all subsequent configurations performed during the life of the controller.

This procedure should only be used as a last attempt to bring back the controller to a usable state.

User “Level 2”:

The “RESET” button will be activated (will become blue) only if no square buttons from the left column are activated and the “Last Saved Settings” from the right column is not activated as well. A “Level 2” user can only reset the “Factory Settings” and/or the “Additional Settings” from the right column.

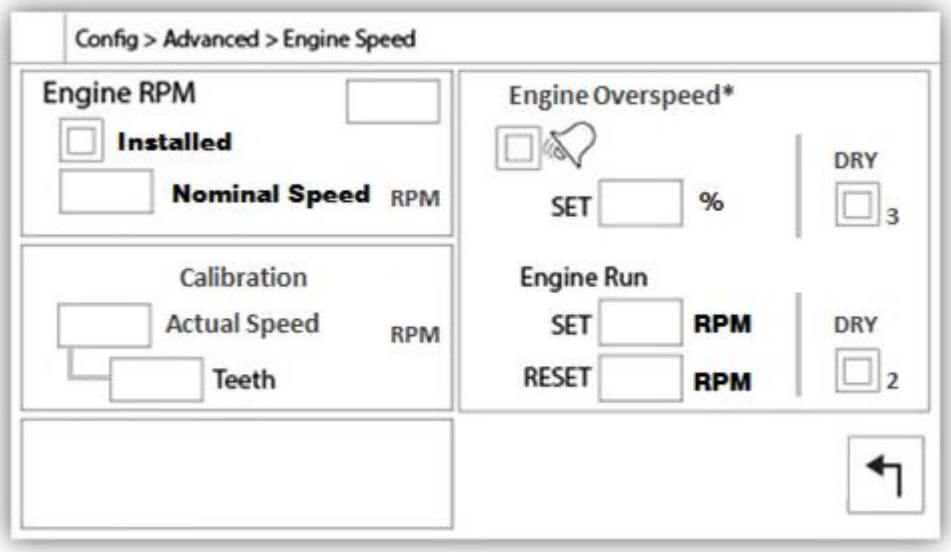
The “Factory Settings” reset will restore the controller to its original factory configuration and service state. This means that the first service will be undone, automatic mode settings, as well as the controller’s “Homepage” will be deactivated until “First Service” is completed again. Please refer to the “Quick Start-Up” guide for more information on how to perform the “First Start-Up” and how to complete the “Field Acceptance Test Report”.

Please note that all logs, pump curves and statistics will not be reset.

The “Additional Settings” reset will update the controller with an additional configuration sent by the manufacturer. It does not perform a true “Factory Reset”. Its purpose is to allow an update of configuration variables that can only be updated by Tornatech Inc.

All other square buttons on this page are “Level 9” security and can only be used by certified Tornatech representatives, unless otherwise specified. The first square in the upper left corner performs the “Select all” function for these parameters.

The Sensors Pages



Important Notice!
Every analog sensor cable used for this controller should be shielded. The shield has to be grounded on the motor side. Not complying to these recommendations may affect the controller good functioning and void its warranty.

The tachometer (analog speed reading) gives the possibility to support engine with no electronic speed switch. The magnetic pickup must be connected to the 2(MP+) and 3(MP-) inputs on the I/O Board.

The first small green line and small red line on the gradations shows the Set point of the “Engine Run” Signal. When the engine runs with a speed above this threshold, the ViZiTouch will consider it is running, and when it slows down under the red line, it will be considered stopped. The second red line, usually set high on the gauge, represents the “Overspeed” threshold. If the engine speed reaches that mark, the “Overspeed” alarm will be activated.

Pressing on the gauge will bring the user to the “Config > Advanced > Engine Speed” page.

The left section is use to show the “Disable/Enable” state of the engine RPM Counter. The “teeth” input box allows the user to match the number of teeth on the flywheel. This is an important setting to allow a precise calculation of the RPM. The digital RPM value is shown just under to acknowledge the calculated RPM.

The right section’s purpose is to configure the set points of both “Engine Run” and “Overspeed” signal. The top square box enables/disables the “Overspeed” alarm, and should always be activated. The following square box links the alarm bell to the alarm, and the third one sets the signal category (alarm or warning). The “SET” input field sets the trigger threshold for the “Overspeed” alarm. The next two input fields allows the configuration of the “Engine Run” signal set/reset points, preventing the “Engine Run” signal to toggle too fast. “Reset” should be at least 300 RPM lower than the “Set” point.

Fuel Level

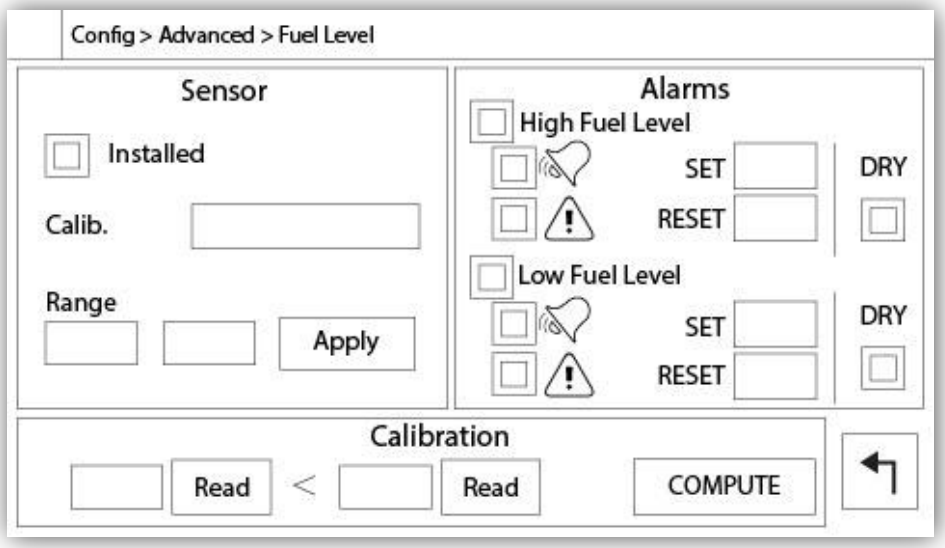
The “Fuel Level” analog input gives the possibility to support engine with no electronic “Low-High Level;” switch. The sender must be connected to the AI4 analog inputs on the I/O Board.

The first small green line and small red line on the gradations shows the Set point of the “Low Fuel Level” Signal. It is active if the level goes below the set point.

The second small green line and small red line on the gradations shows the Set point of the “High Fuel Level” Signal. It is active if the Level goes above the set point.

The rectangle box below the gauge displays the actual value.

Pressing on the gauge will bring the user to the “Config > Advanced > Fuel Level” page.



The left section is use to show the “Installed” state of the Fuel Level Sensor. The rest of the page is already explained in the “Analog sensors” section of the manual.

If the “Calibration Type” is selected to be “ON/OFF” (to be use with powered low fuel level switch), the frame at the bottom of the page will be empty, and a “NO/NC” setting will be available to configure the signal.

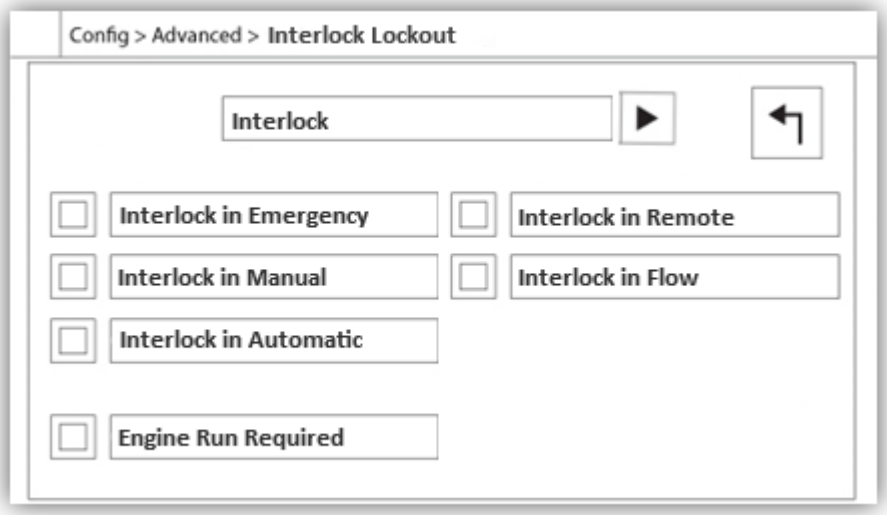
Details of the Debug Page

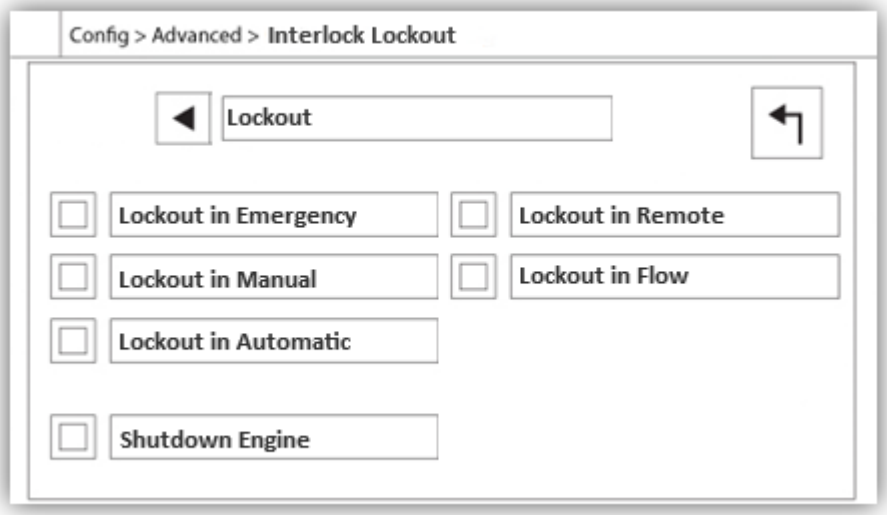
Calibration **Config > Advanced > Debug > Calibration**

This table displays all calibration parameters. The “Scaled” value is the final calculated value used in the ViZiTouch. It is calculated by multiplying the “Raw” value by the “Gain” coefficient and by adding the “Offset” value. This information is useful when debugging the analog inputs on the IO board.

IO Debug **Config > Advanced > Debug > IO**

The small white circle beside each signal is a representation of its state. If the white circle is filled with a green dot, then the signal is activated. Comparing these software signals and the physical state of the signal on the electronic board is the best way to troubleshoot. In the right column, additional “TEST” buttons are located beside each output signal. Clicking on these buttons will toggle the output state of this signal, again allowing a comparison between the software and hardware state of these signals to help troubleshoot.





These pages allow to configure the Lockout input and the interlock output parameters. To be active, those options need to be assigned to an Input or an Output on the I/O board.

Lockout is an Input that disables the engine from starting.
- Enable in emergency: If checked, this option will prevent the electronic assistance on an Emergency start.
- Enable in manual mode: If checked, this option will prevent the Manual start.
- Enable in automatic mode: If checked, this option will prevent the Automatic start.
- Enable in remote manual mode: If checked, this option will prevent the Remote Manual start.
- Enable in "start/stop" mode: If checked, this option will prevent the "start/stop" mode.
- Shutdown Engine: If enabled, the lockout signal will also act as a shutdown and will stop the engine if it is running.

Interlock is an Output that prevents a second engine from starting.
- Enable in emergency: If checked, this option will activate the output "interlock" on an Emergency start.
- Enable in manual mode: If checked, this option will activate the output "interlock" on a Manual start.
- Enable in automatic: If checked, this option will activate the output "interlock" on a Automatic start.
- Enable in Remote Manual mode: If checked, this option will activate the output "interlock" on a Remote Manual start.
- Enable in "start/stop" mode: If checked, this option will activate the output "interlock" on a "start/stop" mode.
- Engine Run required: If enabled, the controller will wait to have the Engine Run signal before activating the Interlock output.

History 7

History (Membrane button) **History**

Select specific pages within the History section. Everything related to the statistics, events, pressure, power logs and the download to USB is available within the History page.

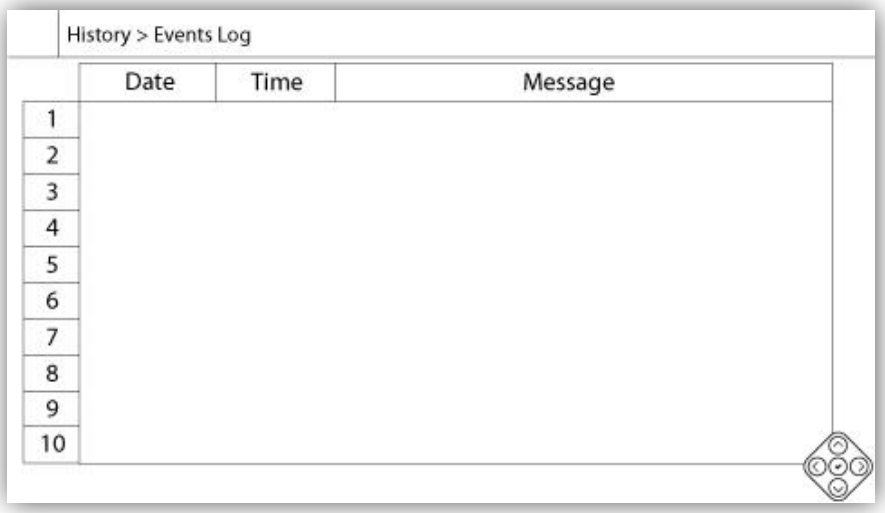
-Events: This button leads to the “Events” page, which displays the most recent 500 events. Each event log contains the date and time of occurrence as well as a brief description of the event.

-Download to USB Device: This button leads to the “Download to USB Device” page, which allows the user to download information, including the user manual, drawings, logs, statistics and configuration.

-All Time Statistics: This button leads to the “All Time Statistics” page, which displays the date and time of the first power up, the date and time when the first start-up was completed and the total “On Time” of the controller. These statistics can never be reset.

Details of the History Page

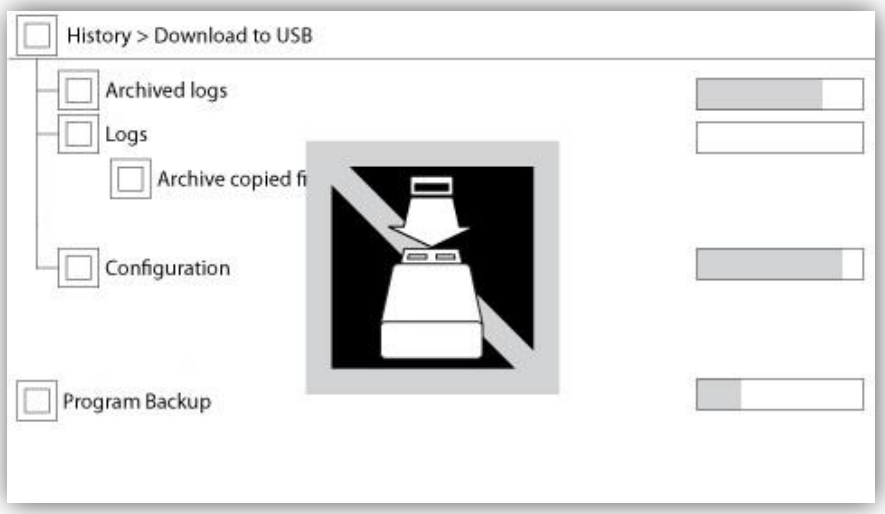
Events Page — History > Events Log



It shows the last 500 events which occurred in chronological order. The first column is the date, the second one is the time of occurrence and the third column is the “Event message”. To obtain a log that is older than 500 events, visit the “Download to USB Device” page and select “Events”. This method will generate a file containing all events logs in the ViZiTouch history.

The contextual navigation pad is implemented in this page. It allows quick navigations functions, like “previous page”, “next page”, “first page” and “last page”. As always, clicking on the Navigation Pad Icon in the lower right corner of the screen will pop-up the Navigation Pad functions specific for this page.

Download to USB Device — History > Download to USB



To download information from the ViZiTouch to a USB Device a user with at least a "level 1" password must be logged in. The first square beside the title is a "Select All" button. Pressing it will select all categories except "Archive copied files", which serves a separate purpose. The "Download to USB" button will execute the command. The entire right side is filled with different progress bars, to help monitor the current transfer. If a USB Device is not present or if there is an error, a message saying "Could not mount USB drive" will appear and any further action is cancelled. To try again, remove the device, re-insert and press the button once more.

-Archived logs: All logs files that were archived using the "Archive copied files" square button. The purpose of archiving files is to free up memory on the ViZiTouch by archiving older log files.

-Logs: All logs are currently available in the ViZiTouch memory. A "Comma Separated Values" or ".csv" file is created every day and is named accordingly. Most software in modern computers will be able to read and interpret these files. The log files contain the event logs, the pressure logs and the power logs.

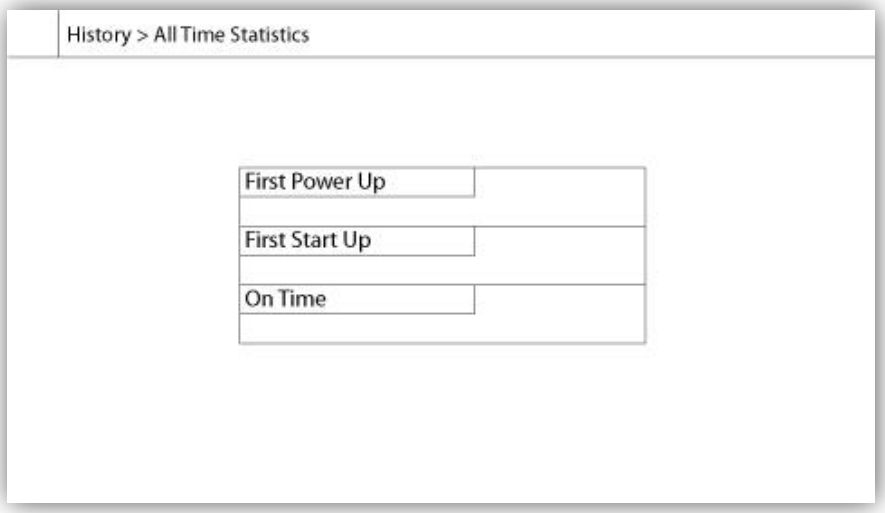
-Configuration: All configuration parameters contained in a ".txt" file, including but not limited to nominal values, serial number, calibration parameters.

Program Backup: A compressed and encrypted file, only readable by the ViZiTouch. This allows the user to copy a complete ViZiTouch to another one. IMPORTANT: The ViZiTouch is not in service while downloading the program backup.

The Statistics

All Time Statistics

History > All Time Statistics



All statistics shown here are calculated since the controller's first start-up was done. All dates are in the YYYY.MM.DD format and all time references are in the HH:MM:SS format.

-First Power Up: Date and time of when the controller was first powered up.
-First Start Up: Date and time of when the controller's first start-up was completed.
-On Time: Total duration of controller powered on since the first power-up. In Day.Hour.Minutes.

How to Test:

Charger 1 Fail
Unpower the charger 1 by putting the circuit breaker in the off position.

Charger 2 Fail
Unpower the charger 2 by putting the circuit breaker in the off position.

DC Failure
Switch Circuit Breaker 3 (CB3) and Circuit Breaker 4 (CB4) in Off position or disconnect #6 and #8 engine wires (See drawing for more details).

Controller Trouble
To activate this common alarm, at least one of the following alarms must be active: Charger Failure 1, Charger Failure 2, DC Failure.

Low Fuel Level
Put a jumper between the dry contact 29-30 of the J25 connector on the I/O board.

High Fuel Level
Disconnect Fuel Level connector. Depending of your sensor type, put a jumper between positive pin (left) or negative pin (right) and signal pin (middle) of this connector (See drawing for more details).

Fuel Tank Leak
Put a jumper between Fuel Tank Leak input and ground (See drawing for more details).

AC Failure
Make sure both batteries are connected and all circuit breakers are in On position. Switch Circuit Breaker 1 (CB1) and Circuit Breaker (CB2) in Off position. Disconnect J44 from the I/O board.

Water Reservoir Low
Disconnect Water Level connector. Depending of your sensor type, put a jumper between positive pin (left) or negative pin (right) and signal pin (middle) of this connector (See drawing for more details).

Pump Room Alarm
To activate this common alarm, at least one of the following alarms must be active: Low Fuel Level, High Fuel Level, Fuel Tank Leak, AC Fail, Low Ambient Temperature, High Ambient Temperature, Low Suction Pressure, Water Reservoir Empty, High Water Level or Water Reservoir Low.

Fail to Start
Disconnect #9, #10 and #12 engine wires (See drawing for more details). Start cranking sequence (Example: Remove Remote Start / Low Water Level jumper). Wait until cranking sequence ends.

Overspeed
You need to be logged in to do this test. Press Config button (On the membrane). Go to Config>Advanced>Engine Speed. Change the Nominal speed at 50% of the regular nominal speed. Start your engine. Don't forget to put back the normal Nominal speed of the engine.

Low Engine Temperature (15)
Disconnect #15 engine wire. Put a jumper between #15 input and ground (See drawing for more details).

Low Oil Pressure
Put a jumper between #4 input and ground (See drawing for more details).

High Engine Temperature
Put a jumper between the #5 input and ground (See the drawing for more details).

Battery 1 Failure
Disconnect #6 engine wire (See drawing for more details).

Battery 2 Failure
Disconnect #8 engine wire (See drawing for more details).

Battery 1 Overvoltage
You need to be logged in to modify these settings. Press Config button (On the membrane). Go to Config. Change Overvoltage Battery 1 setpoint to minimum allowable.

Battery 2 Overvoltage
You need to be logged in to modify these settings. Press Config button (On the membrane). Go to Config. Change Overvoltage Battery 2 setpoint to minimum allowable.

Loss of Continuity 1
Disconnect #9 engine wire (See drawing for more details). Wait 1-2 minutes.

Loss of Continuity 2
Disconnect #10 engine wire (See drawing for more details). Wait 1-2 minutes

Engine Trouble
To activate this common alarm, at least one of the following alarms must be active: Fail to start, Overspeed, Fuel Injection Malfunction (17), Electronic Control Module Fault (14), Low Engine Temperature (15), Low Oil Pressure (4), High Engine Temperature (5), Battery 1 Failure, Battery 2 Failure, Loss of Continuity 1, Loss of Continuity 2, Overpressure or Low Pneumatic Pressure

Engine Fail When Running
Start the engine. Depending of your engine type, disconnect #1 or put a jumper between #12 and #6 to stop the engine. (See drawing for more details).

IO Diesel Communication Error
Press Reset button of the Diesel IO Board (Small button close to the phone jack)

IO Expansion 1 Communication Error
Press the Reset button of the Expansion 1 IO Board (Small button close to the phone jack)

IO Expansion 2 Communication Error
Press the Reset button of the Expansion 2 IO Board (Small button close to the phone jack)

IO Expansion 3 Communication Error
Press the Reset button of the Expansion 3 IO Board (Small button close to the phone jack)

IO Expansion 4 Communication Error
Press the Reset button of the Expansion 4 IO Board (Small button close to the phone jack)

Patents

Country	Title	Grant No
CA	Mechanical activator for contactor	2741881
US	Mechanical activator for contactor	US8399788B2
CA	Mechanical activator for electrical contactor	165512
CA	Mechanical activator for electrical contactor	165514
US	Mechanical activator for electrical contactor	D803794
US	Mechanical activator for electrical contactor	Patent pending
EP	Mechanical activator for electrical contactor	002955393-0001/2
AE	Mechanical activator for electrical contactor	Patent pending
AE	Mechanical activator for electrical contactor	Patent pending
CA	Fire pump digital operator	163254
US	Fire pump digital operator interface	D770313
AE	Fire pump digital operator interface	Patent pending
EP	Fire pump digital operator interface	002937250-0001
CA	System and method for detecting failure in a pressure sensor of a fire pump system	Patent pending
US	System and method for detecting failure of a pressure sensor in a fire pump system	Patent pending

TORNATECH MODEL LFD DIESEL FIRE PUMP CONTROLLER
PRE- FIELD ACCEPTANCE TEST
CHECK LIST

Note: This document should be an official indication of whether or not the installation and general condition of the equipment is adequate for a field acceptance test. This document should also aid the individual responsible for executing the field acceptance test to decide whether or not to carry out the field acceptance test of the equipment.

Installation Check List:		**YES**	**NO**
1	Verify that the nameplate voltages of the Fire Pump Controller corresponds with the AC voltage available and the DC starting voltage of the engine.		
2	Procede to a visual inspection for any damage done to the exterior of the Fire Pump Controller. Make sure the enclosure, alarm bell, membrane and display are not damaged.		
3	Verify that the Fire Pump Controller has been installed within sight of the pump and engine or motor.		
4	Verify that the Fire Pump Controller has been installed not less than 12 inches from the floor of the mechanical room.		
5	Verify that all electrical connections to the Fire Pump Controller are done using liquid tight conduit and connectors.		
6	With the Fire Pump Controller door open, visually inspect for any drill chips, dirt or foreign objects in the bottom of the enclosure, loose wires, broken components and general proper electrician workmanship.		
7	Verify that the correct AC voltage is supplied to the controller by taking a voltage reading at the L & N (220-240) terminals.		
8	Verify that the terminal connections between the Fire Pump Controller and the engine (3, 4, 5, 6, 8, 9, 10, 11, 12, 15, 16 and 20) are properly done.		
9	Verify that wiring to terminals #6, #8 (batteries) and #11 (ground) are of the appropriate gauge size. See label inside controller.		
10	Verify proper grounding of the Fire Pump Controller.		
Initial Power-Up Check List:		**YES**	**NO**
1	With the Fire Pump Controller door open, turn to “ON” the circuit breakers CB3 and CB4 (DC) then CB1 and CB2 (AC), then IS1. This sequence is very important.		
2	Close the Fire Pump Controller door. Verify on the ViZiTouch Homepage that the correct battery voltage appears.		
Manual and Automatic Start Check List:		**YES**	**NO**
1	Verify the starting of engine by pressing the emergency push button.		
2	Stop engine by pressing the “Stop” membrane button.		

T
ornatech Controller S/N: _____

Installation address: _____

_____

_____

Check list completed? _____Yes _____ No

Check list completed by: _____

Company: _____

Date: _____

Witnessed By: _____

Comments: _____

_____

_____

_____

_____

_____

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