AUTOMATIC FILL CONTROLLER

1-5 Tanks

SIMPLEX Insight Onsite

Installation and Operation Manual

Last Revision Date: June 8, 2021

For the most up-to-date information for this product and others, contact Simplex, Inc. at (800) 637-8603 or visit us on the web at http://www.simplexdirect.com.

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I. WARNINGS AND CAUTIONS

I-A. Safety Information Symbols

The following images indicate important safety information:


This General warning symbol points out important information that, if not followed, could endanger personal safety and/or property.


This Explosion warning symbol points out potential explosion hazards.


This Fire warning symbol points out potential fire hazards.


This Electrical warning symbol points out potential electrical shock hazards.

I-B. Warnings

• Improper operation of this equipment such as neglecting its maintenance or being careless can cause possible injury or death. Permit only responsible and capable persons to install, operate, and/or maintain this equipment.

• Potentially lethal voltages and amperages are present in these machines. Ensure all steps are taken to render the machine safe before attempting to work on the equipment.

• All hardware covered by this manual have dangerous electrical voltages and can cause fatal electrical shock. Avoid contact with bare wires, terminals, connections, etc., on the hardware, if applicable. Ensure all appropriate covers, guards, grounds, and barriers are in place before operating the equipment. If work must be done around an operating unit, stand on an insulated dry surface to reduce shock hazard.

• Do not handle any kind of electrical device while standing in water, while barefoot, or while hands or feet are wet. DANGEROUS ELECTRICAL SHOCK MAY RESULT.

• If trained personnel must stand on metal or concrete while installing, servicing, adjusting, or repairing this equipment, place insulative mats over a dry wooden platform. Work on the equipment only while standing on such insulative mats.

• The National Electrical Code (NEC), Article 250 requires the frame of the equipment to be connected to an approved earth ground and/or grounding rod. This grounding will help prevent dangerous electrical shock that might be caused by a ground fault condition or by static electricity. Never disconnect the ground wire.

• Wire gauge sizes of electrical wiring, cables, and cord sets must be adequate to handle the maximum electrical current (ampacity) to which they will be subjected.

• Before installing or servicing this (and related) equipment, make sure that all power voltage supplies are completely turned off at their source. Failure to do so will result in hazardous and possibly fatal electrical shock.

• In case of accident caused by electric shock, immediately shut down the source of electrical power. If this is not possible, attempt to free the victim from the live conductor. AVOID DIRECT CONTACT WITH THE VICTIM. Use a nonconducting implement, such as a dry rope or board, to free the victim from the live conductor. If the victim is unconscious, apply first aid and seek immediate medical attention.

• Never wear jewelry when working on this equipment. Jewelry can conduct electricity resulting in electric shock or may get caught in moving components causing injury.

• Keep a fire extinguisher near the hardware at all times. Do NOT use any carbon tetra-chloride type extinguisher. Its fumes are toxic, and the liquid can deteriorate wiring insulation. Keep the extinguisher properly charged and be familiar with its use. If there are any questions pertaining to fire extinguishers, please consult the local fire department.

•The illustrations in this manual are examples only and may differ from your unit.

SECTION ONE

INSTALLATION

II. DESCRIPTION AND SPECIFICATION

II-A. Overview

The Automatic Fill Controller (AFC) provides intelligent control and monitoring of fuel delivery and storage.

The AFC allows for remote filling of one or multiple tanks while monitoring their fuel level. After an established limit is reached, the filling stops and the operator is alerted. The AFC allows for multi-tank filling and monitoring, and through sensors in the tanks, displays the fuel level in real time.

The design allows for operation of one or multiple tanks from a single filling station. The user-friendly touch screen provides intuitive control and monitoring, while communication options allow for central monitoring from a building management system (BMS).

II-B. Capabilities

The AFC can monitor the fuel levels in one or multiple round or rectangular tanks, each containing up to 100,000 gallons. The AFC controls a single Motorized Ball Valve per tank and monitors the position of each valve to ensure accurate filling of the desired tank. If the position of any tank's valve is not verified, further operation is prohibited for the entire system. This verification prevents the wrong tank from being filled.

II-C. Safety

The AFC monitors the fuel level in each tank and displays the levels in gallons or percentage. Each tank within the AFC can be programmed independently for shape, volume, and height as well as low level alarm (%) and refill (%) alert. The approximate value for the "full" level is 90%, the approximate value for the "high" level is 95%, and the approximate "critical high" level is 98%. These levels are dictated by discrete floats rather than the level transducer.

There are two optional levels for detection through the user interface: the refill level and the low level. Both are adjustable at the user's discretion.

There are redundancies built into the AFC for detection of critical levels of fuel. With the "full" and "high" levels, floats are used to detect the fuel levels. The "critical high" level, however, uses floats as well as a level transducer to provide redundancy for sounding the alarm. The optional levels of "refill" and "low" use the level transducer.

The AFC can also monitor a leak sensor for each tank. When a leak is detected, the AFC disables filling of that tank.

If there is a power loss to the system, the motorized ball valves are fitted with manual overrides to allow filling in emergency situations.

Due to variances in tank design, the values are approximate. For example, some cylindrical tanks may have rounded ends while others may have flat ends.

II-D. Specifications

Input Voltage	115VAC, 1-phase
Frequency	60Hz
Full Load Amps	Varies by unit
Enclosure Type	See drawing for specific rating
Short Circuit Current Rating	5kA @ 120Vac
Communications	MODBUS RTU RS-485 (Optional MODBUS TCP/IP and Bacnet also available)
Tanks Supported	1-5

III. UNPACKING

III-A. Included Components and Parts

The following items are included with your AFC. If any of the following are not included, please contact Simplex at 800-637-8603.

1. Fill controller
2. Valve(s) (If supplied by Simplex)
3. Float assembly(s)
4. Manual
5. Drawings package

III-B. Primary Inspection

Preventative visual inspection of the shipping crate and the fill controller is advised. Never apply power to a fill controller before performing this procedure. The following four-point inspection is recommended before installation and as part of a 6-month maintenance schedule:

1. If the crate shows any signs of damage, examine the fill controller in the corresponding areas for signs of initial problems.

2. Check the entire outside of the cabinet for any visual damage, which could cause internal mechanical problems due to reduced clearance.

3. Check electrical connections for tightness.

4. Examine all accessible internal electrical components.

If any problems are observed during primary inspection, call Simplex 24 hours a day at 800-637-8603

IV. INSTALLATION

IV-A. Overview

The Automatic Fill Controller should be mounted at the filling station, then wired to the power source, float assemblies, valves, and any other sensors or system integration connections. Once mounted and properly wired, the AFC panel must be set up/programmed.

IV-B. Installing Wiring

The AFC panel must be completely wired prior to applying power. Failure to follow the wiring information and guide may result in product damage and loss of warranty coverage. If requested, startup services can be provided by Simplex to check field wiring prior to applying power, as well as assuring proper operation. See job-specific wiring diagrams for details.

If there are any questions about wiring the AFC, please contact Simplex directly. Simplex is not responsible for damage due to incorrect wiring installation.

IV-C. Installing Cable Access

To bring cabling into the fill controller, pull or drill a hole into the cabinet at a location of your choosing and install a comparably rated conduit connector for access to the controller.

IV-D. Installing Control Power

To install control power, see job-specific wiring diagrams for details.

IV-E. Installing Ball Valves

If you have a single-tank system, the ball valve is likely already mechanically and electrically installed. If you have a multi-tank system, you will have to install the ball valves in your fuel pipes and connect them to the fill controller.

Ensure that the Manual Override Switches on each ball valve are set to “(A) Auto.”

See job-specific drawings for valve information.

IV-F. Installing Pressure Relief Valves

In a multi-tank system, you must install a pressure relief valve between the automatic fill controller and the motorized ball valve. The PRV is included in your order.

IV-G. Installing Float Assemblies

To install the float assemblies, push the latch handles on the assembly down and slide the coupler off. See job-specific drawings for float wiring information.

SECTION TWO

OPERATION

V. SETUP

V-A. Controller Setup

After the AFC panel has been wired completely and all connections confirmed, flip the "Control Power" switch to ON to apply power to the panel. On first power up the touch screen will be mostly blank as seen on *Startup Screen.* Below the screen are 5 function keys used in conjunction with the information on the screen. On the *Startup Screen,* the screen shows SETUP above the "F1" function key. In this instance, the "F1" function key would take you to the setup menu.

From the setup screen you may choose to configure the MODBUS setting, SYSTEM settings, or enter the TANK SETUP by pressing the soft keys on the touch screen. (See *Setup Menu*)

Please refer to Appendix B for 7 inch touch screen examples.

Startup Screen

Setup Menu

V-B. System Setup

System Setup

If Motorized Ball Valves (MBV) are installed, you may enter the delay time in seconds for the valve fail timer. You may also select to display the tank level in either GALLONS or LITERS. Tank level in percent will always be displayed regardless if gallons or liters is selected. (See *System Setup*)

V-C. Modbus Setup

Each unit is capable of modbus communication via RS485. You may choose the PARITY, BAUD RATE, and NODE address for the unit. The following information is preset from the factory and may NOT be changed via the touch screen.

PROTOCOL: Modbus HEX
ECHO: 2-Wire
STOP BITS: 1

Modbus Settings

Please refer to the Wiring Diagram in the provided drawing packet for field communication connections.

For TCP/IP or Bacnet communication settings, please see the MODBUS POINTS LIST in the drawing packet shipped with the unit.

V-D. Tank Setup

The controller must be configured for your tanks.

Select tank 1-4 buttons to access each tank setup screen by pressing the respective tank soft key button on the touch screen. (See *Tank Setup*)

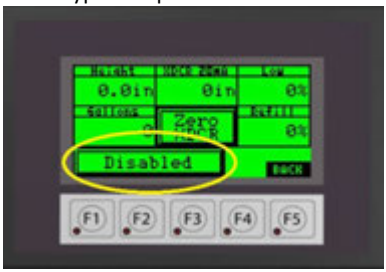
To activate the selected tank, press the "DISABLED" button to select "DISABLED", "ROUND" or "RECTANGULAR" depending on the type of tank. (See *Tank Type Setup*)

You will now need to enter the tank data used to calibrate the level transducer. All data will be entered via a pop up numeric entry key pad accessed by pressing the data entry field. (See *Tank Transducer 1*)

Next, enter the tank interior depth/height in inches in the "Height" field. Enter the maximum tank capacity in gallons in the "Gallons" field. (See *Tank Transducer 1*)

Tank Setup

Tank Type Setup



Tank Transducer 1

You must also enter the transducer length at 20mA in inches. For systems using 0-5 PSI pressure transducers, the length will be 170 inches. For systems using continuous level transducers, you will enter the "Measuring Range" dimension found on the "Continuous Level Sensor" drawing of the provided drawing packet. (See *Tank Transducer 2*)

Tank Transducer 2

Zero Transducer

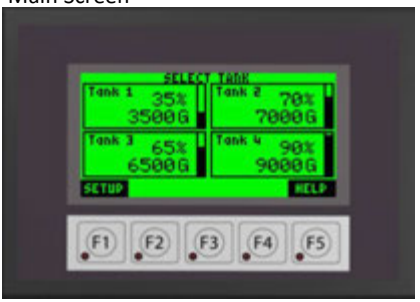
Once the tank shape, height and volume have been set, the level transducer for the tank must be calibrated (zeroed). To do so, remove the probe from the tank or hold it above the fluid level and press and release the "Zero XDCR" button several times to ensure the measurement is accurate. When finished, install/return the probe to the tank. (See *Zero Transducer*)

Enter the level in percent to trigger a low fuel alarm by the level probe. This alarm is in addition to and separate from any low-level floats installed in the tanks. Entering "0" disables this feature. (See *Low Fuel Setpoint/Refill Warning*)

Low Fuel Setpoint/Refill Warning

Enter the level in percent the system should generate a Refill Reminder Warning. Should a tank reach this level, a warning will be generated to inform the site personnel that a fuel delivery should be scheduled. Entering "0" disables this feature. (See *Low Fuel Setpoint/ Refill Warning*)

Main Screen



Repeat the process for each tank in the system. The main screen will now show the active tank information. The current percent and gallons/ liters will be displayed for each tank. (See *Main Screen*)

VI. OPERATING INSTRUCTIONS

VI-A. System Check

Before filling the tank(s), check to see of any alarms or warnings are active. Most alarms and warning will clear when resolved, but some require a hard reset (toggling the Power Switch Off and On) to be cleared.

All alarms and warnings are indicated by an audible horn and red light on the panel below the touch screen and by a red back light on the touch screen. To silence the horn, push the Silence Horn button on the pop-up window on the screen or the push button on the front of the unit. (See *Silence Horn*)

VI-B. Order of Operations

To fill a tank in the system, you must first place the "Control Power" switch below the screen in the On position. This will allow certain options on the screen and powers the motorized ball valves.

Select the appropriate tank by pressing the level indicator for the desired tank. This action will take you to the individual tank detail screen (See *Tank Select*).

On this screen, you will find the current tank status and fill controls.

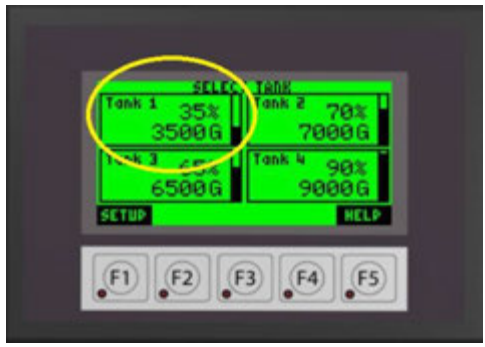
1. *Current tank status*
2. *Fill Start HMI soft key*
3. *Fill Stop HMI soft key*
4. *Tank valve status. If used with a Smart Pump, the on-board pump status will be displayed here as well.*
5. *Current tank level in percent and gallons/liters*
6. *Fill Start Function Key F1*
7. *Fill Stop Function Key F2*

(See *Tank Detail Screen*).

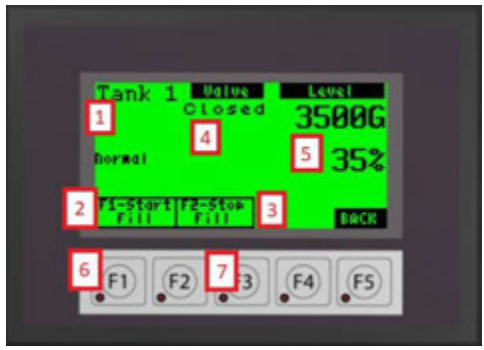
NOTE: Function keys are not used with the 7 inch touch screen option.

Silence Horn

Tank Select



Tank Detail Screen



On the selected tank detail screen, you will see that the tank status is normal and the valve is "Closed" (*Start Fill*).

To start the fill process, first connect the truck ground cable to the ground stud. Unlock the fill box and connect the truck hose to the hose coupling. If used with a Smart Pump, open the valve on the truck at this time. Press the "Start Fill" button or F1. The fill valve will open on the selected tank. The valve status will change from "Closed" to "Travel" to "Opened". If used with a Smart Pump, the on-board pump will start. If not, start the truck delivery pump at this time.

NOTE: If the system is equiped with a pump "Bypass" feature and Bypass toggle switch is in the "Bypass" position, the onboard pump will be disabled until the switch is placed back in the "On-board" position.

The delivery may be stopped at any time by pressing the "Stop Fill" button or F2.

As the tank fills, the level is continuously updated. If you decide to stop filling before the tank reaches "Full" (90% typical), stop the truck delivery pump, and press "Stop Fill" (or F2).

Once the tank reaches the "Full" level (*Tank Full*), the alarm horn will sound to alert the driver and the tank valve will close. The fill process may be started again for 30-second increments by pressing the "Fill Start" again to drain the delivery hose, if needed. If the tank reaches the "High" (95% typical) level, the alarm will sound, the valve will close, and all filling operations for the selected tank will be prohibited (*Tank High*). Another tank may be selected for fill, if applicable.

Repeat the fill process for all tanks in the system until filling is completed. Once filling is complete, close any manual valve, remove the hose, and replace the fill cap. Remove the grounding cable and turn the "Control Power" to Off.

Start Fill

Tank Full

Tank High

VII. ALARMS AND WARNINGS

VII-A. Alarms

The AFC has several states which cause alarms. Alarms are indicated by a red light on the main panel below the touch screen, an audible horn and indicators on the touch screen. The horn may be silenced by pressing the pop up "Silence" button. The specific alarm will be displayed above the silence button. (See *Alarm*)

Tank specific alarms are also displayed on the applicable tank detail screen.

On the 7 inch screen (optional upgrade) the alarms maybe viewed at anytime by pressing the "Alarm History" button on the Main Screen.

Alarm

Alarm	Triggered	Action Taken By AFC
Low Fuel	By Level Transducer	Audio/Visual Alarm only
Refill Warning	Level Transducer	Audio/Visual Warning only
Full	Float Switch	90% tank level typical Audio/Visual Warning Closes valve for selected tank Stops on-board pump
High	Float Switch	95% tank level typical Audio/Visual Alarm Closes valve for selected tank Stops on-board pump Prohibits fill of selected tank
Critical High	Float Switch or Level Transducer	98% tank level typical Audio/Visual Alarm Closes all valves Stops on-board pump Prohibits fill of all tanks
Tank Leak	Float Switch	Audio/Visual Alarm Closes all valves Stops on-board pump Prohibits fill of selected tank

Loss of Flow	Flow Sensor	Audio/Visual Alarm Closes all valves Stops on-board pump Prohibits fill of all tanks
MBV Failure	Loss of signal from valve or incorrect position signal from valve	Audio/Visual Alarm Closes all valves Stops on-board pump Prohibits fill of all tanks
Overload	Motor Starter tripped	Audio/Visual Alarm Closes all valves Stops on-board pump Prohibits fill of all tanks

VII-B. Troubleshooting

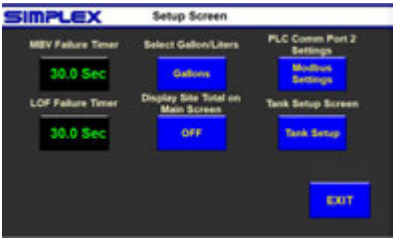
Problem	Cause	Solution
Screen is Blank	1. Control Power isn't available 2. The fuses are blown	1. Ensure the control power switch is in the ON position. If so, contact the facility's manager for power issues. 2. Replace the fuses.
Tank level indication reads "0%" or "0 Gal"	1. Level transducer not calibrated properly. 2. The level transducer is disconnected. 3. The tank has not been properly connected. 4. The tank is empty	1. Re-calibrate the level transducer. 2. Reconnect the level transducer. 3. Check all tank field connections. 4. Schedule fuel delivery.

Tank indicates "Full," "High," "Critical High"	1. The float stem has been disconnected. 2. The float stem is not receiving power 3. The fuses are blown 4. The tank is at critical high level	1. Reconnect float stem. 2. Check float stem wiring. 3. Replace fuses. 4. Cease filling operations.
Tank indicates a valve failure	1. The fuses are blown 2. The valve mode selector switch is not in AUTO 3. The valve was not properly installed	1. Replace fuses. 2. Place selector switch in AUTO. 3. Check all valve field wiring.

APPENDIX A – 7 INCH SCREEN REFERENCE

Startup Screen

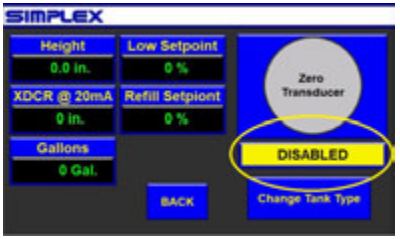
Setup Menu



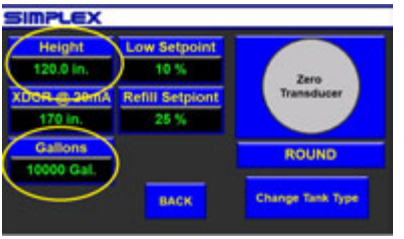
Modbus Settings

Tank Setup

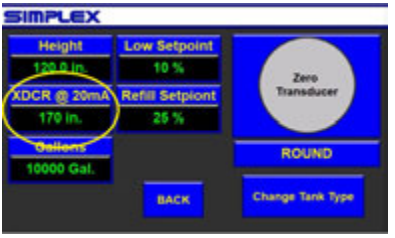
Tank Type Setup



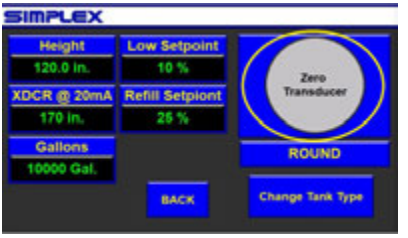
Tank Transducer 1



Tank Transducer 2

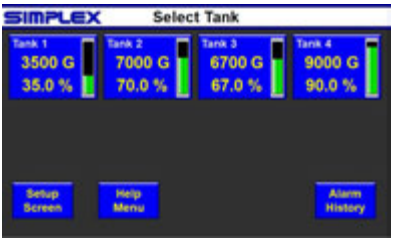


Zero Transducer



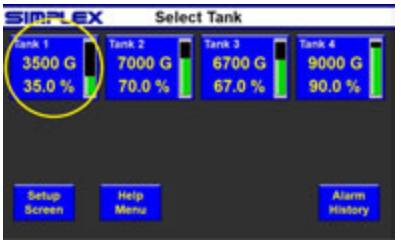
APPENDIX A – 7 INCH SCREEN REFERENCE

Main Screen



Silence Horn

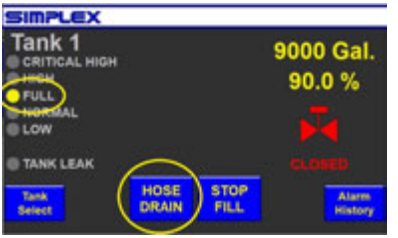
Tank Select



Tank Detail Screen

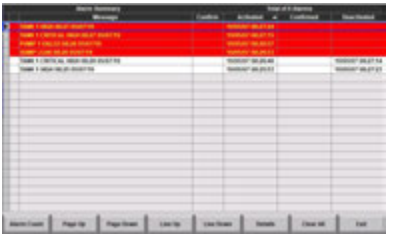
Start Fill

Tank Full

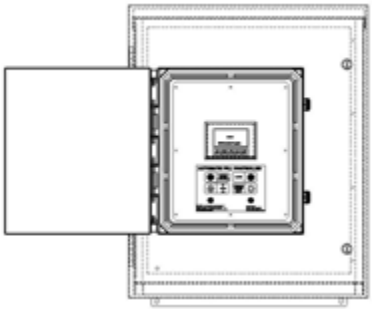


Tank High

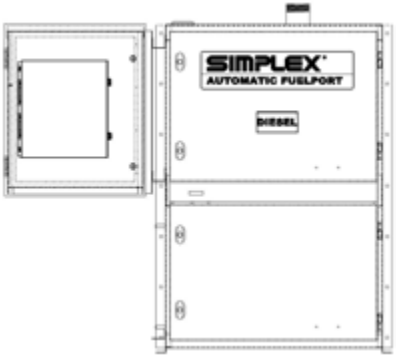
Alarm



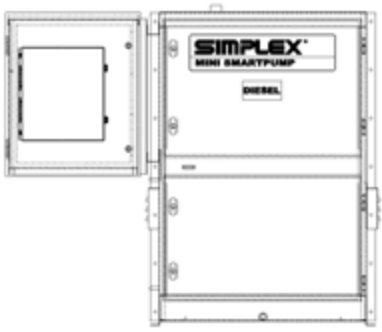
APPENDIX B - SUPPORTED UNIT TYPES



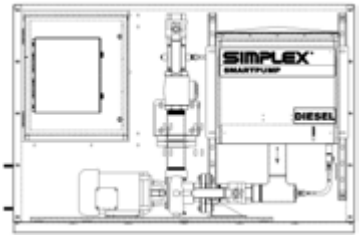
Ship Loose Controller



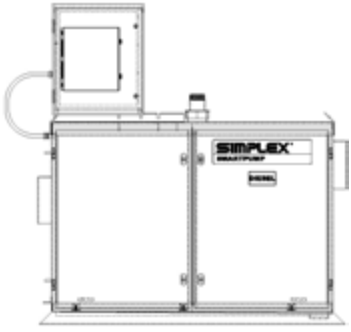
Automatic Fuel Port



Mini Smartpump



Smartpump



Enclosed Smartpump

Contact Simplex

for all your Load Bank and Fuel Supply needs.

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www.simplexdirect.com

SIMPLEX® Insight Onsite