Bennett BlueFueler Series
100 & 200 Series for Diesel Exhaust Fluid Dispensers

Installation Manual
Only Trained Personnel May Work on This Equipment

<u>Models include:</u>
105S - 5 GPM suction, commercial (gallon-only registration)
110S - 10 GPM suction, commercial (gallon-only registration)
110R - 10 GPM remote, commercial (gallon-only registration)
205S - 5 GPM suction, retail (dollar and gallon registration)
210S - 10 GPM suction, retail (dollar and gallon registration)
210R - 10 GPM remote, retail (dollar and gallon registration)

READ THIS BOOK
This book has important information for safe installation and operation of this equipment. Read and understand this book before applying power. Keep this book and tell all service personnel to read this book. If these instructions are not followed, bodily injury, death, or damage to the equipment may occur.

For new books, FAX to:
BENNETT MARKETING SERVICES
231-799-6202
or visit our web page at:
http://www.BennettPump.com

For use in Non-Hazardous Locations
Environmental - For use between 12° - 90° F

113914 Rev B 09/16/10

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NOTICE

Not all equipment covered in this manual is listed by Underwriters Laboratories. Only those products that bear the Listing Mark of Underwriters Laboratories are listed.

IMPORTANT

Examine the shipment immediately upon arrival to make certain there has been no damage or loss in transit. Bennett Pump Company, as shipper, is not liable for the hazards of transportation. Please make damage claims directly to the truck line.

Safety Instructions

For the safe installation of this equipment, read and understand all warning and cautions. Look for these warnings:

⚠ **"DANGER"** means: If you do not follow the instructions, severe injury or death will occur.

⚠ **"WARNING"** means: If you do not follow the instructions, severe injury or death can occur.

⚠ **"CAUTION"** means: If you do not follow the instructions, damage can occur to the equipment.

⚠ **DANGER:** To prevent injury to you from vehicles and onlookers, always place a barrier around this equipment before performing service or maintenance.	⚠ **WARNING:** You must have training in the operation and programming of this dispenser before using it. READ THE RELATED MANUALS.
⚠ **DANGER:** Disconnect all power to this equipment and associated submerged pump(s) during installation, service or any maintenance, i.e., changing filters.	⚠ **WARNING:** Make sure this equipment is correctly grounded. Failure to do will cause injury, damage to equipment, or improper operation. Improper grounding voids the warranty.
⚠ **WARNING:** You must have training in the installation, service or maintenance of this equipment (dispenser, pump, console, control box or submerged pump) before working on it. Maintenance repairs must be done by authorized personnel only. Warranty work may only be performed by Bennett certified technicians.	⚠ **WARNING:** Do not operate this equipment as a dispenser unless it is completely assembled
	⚠ **CAUTION:** Do not drill holes in DEF dispensers. Holes can cause failure of the electronic equipment. The warranty will become void. Use only adhesive backed sign mounting brackets.
⚠ **WARNING:** To prevent electric shock, keep the electrical parts of the dispenser dry.	⚠ **CAUTION:** Product freeze may cause damage to the dispenser. AUS-32 (DEF) fluid should not reach temperatures below 12° F. or -11 ° C. The warranty will become void.
⚠ **WARNING:** Electronic components are static sensitive. Use proper static precautions (static straps) before working on the equipment.	

READ AND UNDERSTAND ALL WARNING LABELS ATTACHED TO THE DISPENSER

BlueFueler Dispenser Specification Sheet
Commercial (Industrial) Volume Only Display

Standard Features
- Simple electronic computer
- Stand-alone or Interfaced to Control Device
- RS485 interface or dual pulse output
- Exclusive eCal™ (Electronic Calibration)
- Magnet activated totals display
- Programmable unit of measure for US gallons, liters, or imperial gallons
- Operates from 115V or 230V 60/50Hz
- Self contained (suction) models feature a 4 piston diaphragm pump
- Back lit LCD displays
- Self-contained (suction) models: single, 1-product-single hose
- Remote models: single, 1-product-single hose

Construction
- Low Hose Cabinet Design
- Side mount nozzle boot
- Long-life cabinet construction using galvaneal components and powder coated panels
- Standard blue (optional colors available)
- Hinged swing out upper door
- Heavy duty hose hook

Computer
- Simple single board design electronics. Includes CPU, power, display, eCal, RS485 connection, electromechanical analog totalizer, push-button programming switches, wiring terminal strip
- LED Backlighting board for the LCD display
- Optical pulser
- Long life, highly visible back lit LCD display, 1" (2.54cm) numerals
- Battery Backup for last sale recall during power outage (required for resale of product)

Computer (cont'd)
- Simple 2-command protocol via RS485 interface to fleet management systems supplies pump status, pulses, volume sale & volume totals
- Field wiring goes directly to terminal strip on Computer (for new installations pull 60" of wire above grade level)
- Transaction display of: 999.999 for gallons, 9999.99 for liters
- Electronic hose totals of:
  - 99999999.999 for gallons (8.3)
  - 999999999.99 for liters (9.2)
- Built-in diagnostics with error codes

Hydraulics
- Meter is electronically calibrated (eCal).
- All remote units include built-in inlet check valves to keep the hydraulics full and prevent meter/pulser count-up when the pump pressurizes the system
- All units feature 1" hose outlets
- Self priming feature on suction units.
- 1" BSPP ground inlet
- Stainless steel two-stage prepay/preset electric solenoid valve

Options
- Programmable Dual Pulse Output Board to interface to fleet management systems & tank monitoring system if direct RS485 is not used
- Custom colors and/or graphics
- AUS-32 (DEF) compatible hoses and nozzles
- Dual Suction Pumps

Units have been tested and found to comply with the limits for a Class A computing device in accordance with Subpart J of Part 15 of FCC Rules regarding radio frequency interference.

Specifications in this document are subject to change without notice.

BlueFueler Dispenser Specification Sheet
Retail Money & Volume Only Display

Standard Features
- Simple electronic computer
- Stand-alone or Interfaced to Control Device
- RS485 interface or current loop or dual pulse output
- Exclusive eCal™ (Electronic Calibration)
- Magnet activated totals display
- Programmable unit of measure for US gallons, liters, or imperial gallons
- Operates from 115V or 230V 60/50Hz
- Self contained (suction) models feature a 4 piston diaphragm pump
- Back lit LCD displays
- Self-contained (suction) models: single, 1-product- single hose
- Remote models: single, 1-product- single hose

Construction
- Low Hose Cabinet Design
- Side mount nozzle boots
- Long-life cabinet construction using galvaneal components and powder coated panels
- Standard blue (optional colors available)
- Hinged swing out upper door
- Heavy duty hose hook

Computer
- Simple single board design electronics. Includes CPU, power, display, eCal, RS485 or current loop connection, electromechanical analog totalizer, push-button programming switches, wiring terminal strip
- LED Backlighting board for the LCD display
- Optical pulser
- Long life, highly visible back lit LCD display, 1" (2.54cm) numerals for money & volume; 1/2" (1.27cm) numerals for price-per-volume
- Battery Backup for last sale recall during power outage (required for resale of product)

Computer (cont'd)
- Simple 2-command protocol via RS485 interface to fleet management systems supplies pump status, pulses, volume sale & volume totals
- Current loop Bennett fuel protocol interface
- Field wiring goes directly to terminal strip on Computer (for new installations pull 60" of wire above grade level)
- Transaction display of: 999.999 for gallons, 9999.99 for liters and 6-digits for money with programmable decimal point
- Electronic hose totals of:
  - 99999999.999 for gallons (8.3)
  - 999999999.99 for liters (9.2)
- Built-in diagnostics with error codes

Hydraulics
- Meter is electronically calibrated (eCal).
- All units include built-in inlet check valves to keep the hydraulics full and prevent meter/pulser count-up when the pump pressurizes the system
- Self priming feature on suction units
- All units feature 1" hose outlets
- 1" BSPP ground inlet
- Stainless steel two-stage prepay/ preset electric solenoid valve

Options
- Programmable Dual Pulse Output Board to interface to fleet management systems & tank monitoring system if RS485 is not used
- Custom colors and/or graphics
- AUS-32 (DEF) compatible hoses and nozzles.
- Dual Suction Pumps

Units have been tested and found to comply with the limits for a Class A computing device in accordance with Subpart J of Part 15 of FCC Rules regarding radio frequency interference.

Specifications in this document are subject to change without notice.

Product Specifications

POWER REQUIREMENTS

AC Power Input, Electronic... Input 120 or 230 Volts A.C. 50/60 Hz.
AC Power Input, Motor.. Input 120 or 230 Volts A.C. 50/60 Hz.
DC Power Supply Outputs .... +5VDC 100mA Max, +12 VDC 100mA Max.
DC Power Supply Outputs .... 24 VDC 1.0 Amps Max., +5VDC Isolated 50mA Max
Nickel-Cadmium Battery Output... +10.8VDC, 250 Milliamp Hours

ENVIRONMENTAL REQUIREMENTS

Electronics Operating Temperature Range.................... -30 to +50°C
Humidity.. 0-95% condensing
AUS-32 (DEF) Fluid... Follow ISO Standard 22241

DIMENSIONS

100/200 Series .... 52" H x 13" W x 11" D

Determining the Model Number

Determine the model number of the dispenser from the serial plate located on the dispenser. Utilizing the chart below determine the features of the dispenser to be installed. Understanding the features of the dispenser to be installed will be helpful in understanding the proper installation of the dispenser.

How a Model for the BlueFueler Series Dispenser is Made Up.

Pump Model	Retail	Commercial	Electronics	Flow Rate	# Products	# Hoses	Motor
105		X	531 Package	*5 GPM	1	1	Single Suction
110		X	531 Package	*10 GPM	1	1	Dual Suction or Remote
205	X		210 Package	*5 GPM	1	1	Single Suction
210	X		210 Package	*10 GPM	1	1	Dual Suction or Remote

*Flow rates are "nominal" (under ideal test conditions without accounting for system restrictions such as hanging hardware). Actual flow rates will vary depending on conditions of installation.

Dispenser Identification Number (DIN) Summary

DEF 100/200 Series DIN

Bennett Pump To Complete Fields 16 to 27

| 1 | 2 | 3 | 4 | | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | | 13 | 14 | 15 | | 16 | 17 | 18 | | 19 | 20 | 21 | | 22 | 23 | 24 | | 25 | 26 | 27 | <---Field Positions |
| 2 | 1 | 0 | S | - | G | N | N | N | N | N | N | B | - | C | I | T | - | B | P | C | - | U | S | A | - | E | N | G | - | 0 | 0 | 1 | <---Sample Pump |

16 through 27----->

16 | Graphics--Country--Language--Suffix Number. Assigned at factory during entry …
…of the order. These, if used, supercede the Lower Door Graphics Selection. …
…Do not enter data into these data fields reserved for Bennett Order Entry.

15 |

14 |

13 | Credit Network: 3 letters in fields 13, 14, 15

12 | Unit Color: "B" - DEF Blue; "A"=Black; "G"=Green; "R"=Red; "W"=White; "Y"=Yellow; "S"=Stainless; "E"=Extended Graphics

11 | Future Option - Use "N"

10 | Nozzle Options: N = none; A = TDW; B = OPW Fixed; C = OPW with Swivel

9 | Hose Options: N = none; A = 10 foot long; B = 12 foot long; C=15 foot long

8 | Electrical options   A = 115VAC; B = 230VAC all 60 HZ

7 | Payment Options: N = none; C =Bennett Credit; D=Bennett Debit/Credit Reader; M=Verifone MX760, L=Local Preset

6 | Fleet Interface: "N" = none; "P" = Pulse Output Board

5 | Unit of Measure: "G" = Gallons; "L" = Liters "I" = Imperial Gallons

4 | Hydraulic Type - "S" - self-contained unit; "R" = remote unit.

2 & 3 | Flow rate in gallons per minute - "05" is 5gpm; "10" is 10gpm.

1 | Computer type - "1" for commercial; "2" for retail computer

Unloading, Unpacking, and Proper Storage

Bennett dispensers are bolted to a pallet and then carefully packaged with cardboard/styrofoam liners and a cardboard exterior carton. The entire package is then securely wrapped with plastic shrink wrap. Use a fork lift to transport the dispenser while it is still on the pallet.

Before signing the freight delivery receipt, inspect the carton and pallet for any obvious signs of damage to the dispenser. If any damage is found, instruct the delivery driver to make a notation on the delivery receipt before signing. If possible, open the carton and inspect the dispenser before signing the delivery receipt.

Bennett dispensers are shipped F.O.B. This means that the title to the equipment passes to the purchaser at the time the equipment is loaded on the truck at our factory. Freight damage claims are the responsibility of the purchaser. Bennett will assist in preparing any damage claim, by helping to identify and price any parts necessary to make needed repairs.

Carefully remove the plastic shrink-wrap from the carton. Then carefully remove the cardboard container and any inside liners. DO NOT DISCARD THE PACKAGING. Should the need arise to repackage the dispenser, the cardboard packaging can be reused. Plastic shrink-wrap can be purchased at office supply stores or industrial packaging stores.

Examine the exterior panels for any signs of freight damage. If shipping damage has occurred after signing for delivery, call the freight carrier immediately and request an inspection. DO NOT DISCARD THE PACKAGING; the inspector will want to examine it.

If there is no freight damage to the exterior of the dispenser, use the door key (wire tied to the nozzle hook) to unlock the upper door. Remove the lower panel from the dispenser. Visually examine the interior of the dispenser for shipping damage. While the dispenser is extremely sturdy, a dispenser that has been "dropped" can suffer damage internally even while it appears normal on the exterior.

Read the model/serial plate of the dispenser and check to confirm that the hydraulic configuration is what your order specified.

Report any non-shipping related problems to Bennett Customer Service:

In USA, telephone (800) 423-6638 or outside the USA, telephone (231) 798-1310; or via FAX to (231) 799-6202; or via email to techhelp@bennettpump.com. Or write to us at:

Bennett Pump Company
1218 E. Pontaluna Road
Spring Lake, Michigan, USA 49456

After freight inspection, it is extremely important to store the new dispensers in a heated building prior to installation. Bennett factory test all units with de-ionized water prior to shipment. If stored in an environment that is below freezing (32° F.), internal components will freeze or crystallize. This will cause damage to the internal hydraulics at startup if these guidelines are not followed. Any damages related to improper storage are not covered under the Bennett Limited Warranty for DEF dispensers.

Piping Notes for Remote (Pressurized) Dispensers

General -
The total length of horizontal piping between the pump and tank must be no longer than 20 feet.

The dispenser must be mounted on a concrete foundation. Do not pour concrete around the product pipes or electrical conduit.

All piping, hoses, and any fluid handling fittings must be approved materials compatible with AUS-32, (Diesel Exhaust Fluid).

Make sure all local and national codes are followed during installation of the Bennett equipment.

Follow Petroleum Equipment Institute's *RP1100 Recommended Practices for the Storage and Dispensing of Diesel Exhaust Fluid (DEF)*

Copies of PEI's recommended practices can be ordered through their web site at: www.pei.org

NOTE: All piping must be clean and free of debris before it is put into Service. All Fluid handling components must be cleaned with de-ionized water per ISO standard 22241.

NOTE: AUS-32 (DEF) is, at this time, classified as non hazardous material.

Piping Notes for Self-Contained (Suction) Pumps

General -

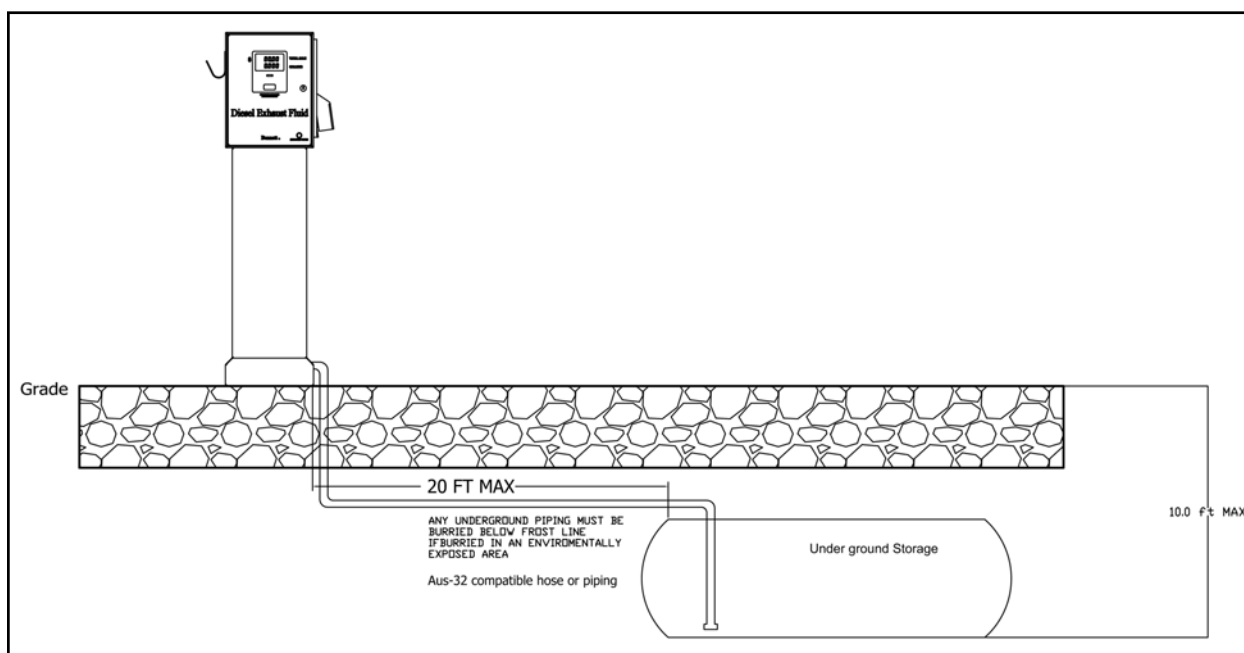The total length of horizontal piping between the pump and tank must be no longer than 20 feet.

Unit should be mounted on the same plane or as close to as possible on what the tote or tank will be set on.

Static lift on self-contained units must not exceed 10 feet (vertical distance between product level in the storage tank and the center of the pumping unit).

Use new 1" AUS-32 (DEF) compatible piping. Refer to ISO Standard 22241-3 for recommended material.

Only one dispenser is permitted for each supply pipe. Two dispensers on one suction line will not work.

All Installation work must conform to federal, state, and local code.

Follow Petroleum Equipment Institute's *RP1100 Recommended Practices for the Storage and Dispensing of Diesel Exhaust Fluid (DEF).*

Copies of PEI's recommended practices can be ordered through their web site at: www.pei.org
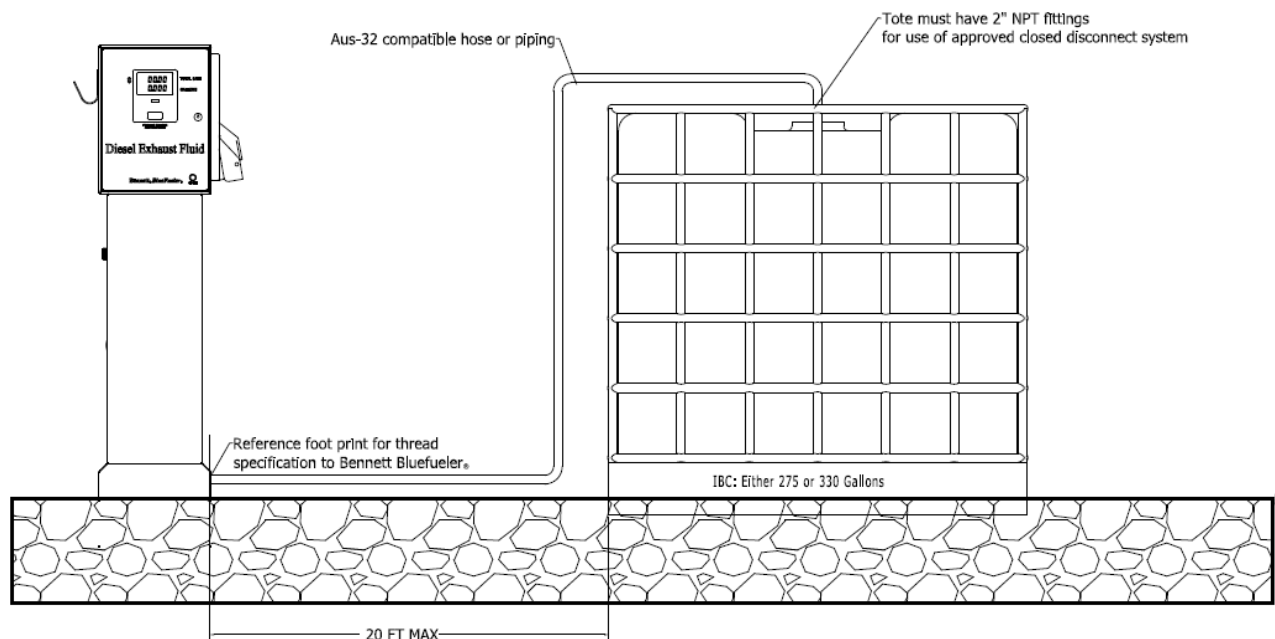
NOTE: All piping must be clean and free of debris before it is put into Service. All Fluid handling components must be cleaned with de-ionized water per ISO standard 22241.

NOTE: AUS-32 (DEF) is, at this time, classified as non hazardous material.

Electrical Field Wiring - General Information

Electrical Wiring Section -

For **100 Series** go to page 14

For **200 Series** go to page 28

Find the wiring diagram specific to the dispenser model that is being worked on in the Wiring Diagrams section. Read and follow all directions including supplemental notes contained on the drawing.

The dispenser's field wiring connections are in the upper electronics head (electrical enclosure) of the dispenser. Using the door keys shipped with the dispenser, (on side 1) unlock the lock on the upper electronics enclosure and open the door to access the wiring terminal on the CPU/ Control board.

All field wiring must be stranded copper, oil and gas resistant (THHN) color coded, with a 600 volt insulation rating. See wiring diagrams section for proper wire sizes. Pull 60" extra wire to reach the top of the dispenser. Do not use wire nuts. The ends of the wires should be clean and free from oxidation.

Conduit for the field wiring must be 3/4", rigid metal and continuous. The use of PVC conduit is not allowed. All conduit between the building and each dispenser should be a separate conduit run.

For Remote dispensers, Bennett requires the installation of RC networks across the coil and contactors of the sub-pump relays for proper operation of the dispenser. Failure to install the RC networks will void Bennett's limited warranty.

Intercom wiring must be in a separate conduit from the dispenser conduit. DO NOT install intercom wiring in with the dispenser wiring, as this will void the Bennett Warranty and improper system operation will result.

Dispenser Electronic Power must be on a separate dedicated circuit breaker. Do not put submerged pump power on this circuit breaker. Up to two dispenser may be placed on (1) 15 amp circuit breaker. No more than two dispensers per 15 amp breaker. All dispensers at the station must be on the same phase of power.

All dispenser field wiring between the building and the dispenser for power, neutral and ground wire conductors must not be spliced, wire nutted or shared with any other equipment. Doing so would void the Bennett Limited Warranty. All power, neutral and ground conductors shall be run from the dispenser to the main service panel.

Electrical contractors must pull 60" of wire above the grade level to reach through the dispenser's conduit and into the electrical area at the top of the dispenser. Read and follow all instructions on the wiring diagram and observe all national and local electrical codes.

Electrical Field Wiring - General Information (Cont'd)

In instances where new dispensers are replacing old dispensers, Bennett recommends new wiring be pulled to each dispenser.

The maximum distance from the breaker panel to the dispenser is 500 feet.

WARNING: <u>DO NOT CROSS PHASE REMOTE DISPENSERS OR DAMAGE WILL OCCUR</u>. When installing more than one dispenser the remote sub-pump relay control wire from each dispenser must be on the same phase of power or cross phasing will occur at the sub-pump relay. This means that the electronic power for all dispensers at the site must be on the same phase.

Electrical Conduits - Make sure that each dispenser has a dedicated electrical conduit. Wiring from multiple dispensers in a single conduit is not allowed. All conduit should be rigid metal and drawn up tight. The use of PVC (plastic) conduit is not allowed and will void the Bennett Warranty. Make sure any intercom wiring is not run with dispenser field wiring. A separate (second) conduit must be run if intercoms are used near the dispenser.

Purging Product Lines for Remote Dispensers

Once product piping and tanks have been tested for leaks and any leak conditions have been fixed, and all electrical connections have been made and verified, the remote dispenser product lines must be purged of all air that may be trapped in the lines.

⚠️ **WARNING! Take appropriate measures to contain any product loss. Dispose of any spilled product in a proper manner consistent with applicable laws and codes.**

Use a test prover can or other appropriate approved container to dispense diesel exhaust fluid through the dispenser. Begin dispensing by only slightly opening the nozzle to allow any entrapped air in the dispenser to slowly release through the nozzle. This prevents over-speeding of the meter.

Once the dispenser has been purged of all air, the DEF meter should be tested for calibration. Refer to the appropriate section in this manual for calibration procedures.

Purging Product Lines for Self Contained Systems

Once product piping and tanks have been tested for leaks, any leak conditions have been fixed, and all electrical connections have been made and verified, the self contained (suction) dispenser product lines must be purged of all air that may be trapped in the lines.

⚠️ **WARNING! Take appropriate measures to contain any product loss. Dispose of any spilled product in a proper manner consistent with applicable laws and codes.**

Suction units are equipped with flow sensors that are tripped when the product lines are empty. You must press the sensor override switch located in the electronics head while purging the product lines.

Use a test prover can or other appropriate approved container to dispense diesel exhaust fluid through the dispenser. Begin dispensing by only slightly opening the nozzle to allow any entrapped air in the dispenser. This prevents over-speeding of the meter.

Once the dispenser has been purged of all air, the DEF meter should be tested for calibration. Refer to the appropriate section in this manual for calibration procedures.

Sensor Override Switch

Wiring the 100 Series Dispenser
Commercial Computers

See General Wiring Requirements on pages **11,12**

Determining the Number of Wires Needed

The 531 commercial electronics package in the 100 series unit is a very simple design. There will be one "control" (CPU) board. This control board is where the field wires will connect if utilizing a remote (submerged) pump. The field wires will connect to a 10 pin terminal strip if the dispenser is equipped with a suction unit utilizing a flow sensor.

Step 1. <u>Dispenser Power -</u> Every model of 100 Series requires these wires:
>**(1) 12ga. Green ground wire**
>**(1) 14ga Black L1 (hot) power wire for electronics power.**
>**(1) 14ga. White for neutral**

Step 2. <u>Console Communications -</u>If the dispenser is to be connected to a control console recognizing Bennett RS485 protocol, remote communication wires will be needed. The 100 series model dispenser uses RS485 communication to the control console.
>**(1) 18ga. wire for RS485 communication positive. (Yellow)**
>**(1) 18ga. wire for RS485 communications negative. (Orange)**
>**(1) 18ga. wire for RS485 communication common. (Brown)**

Note - Use twisted wires for the communication wiring at 8 twists per foot. Warranty will be void if wire is not twisted together. Please refer to the RS485 Communication Wiring Diagram located in the Wiring Section of this manual.

Step 3. <u>Remote Dispensers (Submerged Pump) -</u>a remote relay control wire will be required for each dispenser.   Please refer to the Remote Power Wiring Diagram located in the wiring section of this manual.
>**(1) 14ga. Wire for motor control (Blue)**

Step 4. <u>Self-Contained (Suction Pump)-</u> Additional wires are not necessary. Suction pumps share power with the electronics through the 5 position terminal strip. Please refer to the Self Contained Power Wiring Diagram located in the wiring section of this manual.

Step 5. **<u>Mechanical Pulse Output</u> -** If the dispenser is to be wired to a **mechanical interface Card/ Key system,** the following wires will be needed: Note - A **Bennett Pulse Output Board** is required**.** Field wiring will be connected between this board and the third party interface system. This board will be mounted on the deck inside the electronics enclosure. Please refer to the Pulse Output Wiring Diagram located in the Wiring Section of this manual.
>**(2) Pulse output wires (+) and (-) 18 ga. ***
>**(2) Pulse output wires for tank gauge interface (+) and (-) 18 ga. (If applicable)**
>**(2) Handle circuit wires (+) and (-) 18 ga. ***
>**(1) Authorization wires (+) and (-) 18 ga. ***

*Note - The Installer should following the recommended color coding for field wires found in the Pulse Output Wiring Diagram section of this manual.

Pulling the Field Wires

Open the lower panel on the dispenser and locate the electrical conduit inlet. The conduit inlet is located on side 2 on the bottom left corner. This is where the conduit and all of the field wires will be pulled into the Electronics enclosure. Side 1 of the dispenser is the side with the serial plate on the inside deck. Pull the dispenser wires through the conduit and into the upper electronic enclosure. Make sure that the copper ends of the wires are clean and free of oxidation.

Electrical contractors must pull 60" of wire above the grade level to reach through the dispenser's conduit and into the electrical area at the top of the dispenser. Read and follow all instructions on the wiring diagram and observe all national and local electrical codes.

Proper Equipment Grounding

INSTRUCTIONS FOR EARTH GROUNDING THE EQUIPMENT

WARNING: Failure to properly ground the equipment can cause injury or damage to the equipment and will void the Bennett limited warranty.

This product must be properly grounded. Each dispenser requires a 12-gauge Green earth ground wire. Grounding provides a path of least resistance for electric current to reduce the risk of electric shock. Grounding is also required to protect the dispenser's computer from external electrical noise generating devices.   The ground wire connection must provide 1 ohm (or less) resistance to earth ground.   To establish a good earth ground, follow this procedure:

1. Connect a 12-gauge (minimum), green stranded wire to the grounding terminal on the electronics enclosure deck. Only one ground wire is required per dispenser.

2. Pull the wire through the rigid metal conduit and connect it directly to the ground bar of the **MAIN** electrical service panel, not a sub-panel. Do NOT rely on the metal conduits as a ground anywhere in the system.

    DO NOT USE WIRE NUTS ON GROUND WIRES. USE COMPRESSION CONNECTORS ONLY.

3.   Do not daisy-chain ground wires. All ground circuits must be dedicated wires connected directly to the ground bar in the main electrical panel. A direct connection to the site's ground rod must be connected to the ground bar in the main electrical panel.

AC Power Installation

Each dispenser uses one 115V or 230V 50/60 Hz circuit for dispenser power. Make sure the power source has the correct frequency and voltage. Connect the electrical circuit to the terminal strip on the CPU board or the terminal block on the electronics deck. Only one dispenser electronics Hot and Neutral needs to be pulled per dispenser. That power will be shared by the CPU and suction motor (if applicable).

Reference Note: L1 is hot and L2 is Neutral.

Electronic Power Connections: Remote
1.   Connect the White (Neutral) 14ga. wire to terminal 1 of TS2 on the CPU board. The CPU board is located on the upper electronics door.
2.   Connect the Black (Hot) 14ga. wire to terminal 2 of TS2 on the CPU board.
3.   Dispenser power must be connected to a dedicated 15 amp. circuit breaker. Electronic power for all dispensers at an installation must be wired to the same AC line phase or damage from cross phasing will result in the remote sub-pump relay control circuits.

Electronic Power Connections: Self Contained Suction
1.   Connect the White (Neutral) 14ga. wire to "NEUTRAL" on the terminal block. The terminal block is located in the upper electronics enclosure.
2.   Connect the Black (Hot) 14ga. wire to "L1" on the terminal block.

Rules to ensure proper operation:
1.   Each dispenser uses one 115V or 230V circuit for dispenser power. Put no more than two (2) dispensers on a circuit breaker.
2.   Do not connect any other devices or motors to these circuits.
3.   Put the pump wiring in a dedicated separate conduit. Do not put non-pump related wires, such as price signs or intercoms, in the same conduit as pump wiring.
4.   Use only 14-gauge stranded gas and oil resistant THHN wire.
5.   Do not use wire nuts anywhere in the pump wiring runs.

⚡ **WARNING: All Dispenser AC Power circuits (For Remotes Systems Only) must be on the same phase or damage will result to the dispenser power board or the sub-pump relay box.**

Connecting Pump Motor Power for Remote Dispensers

Remote dispensers require the use of submerged pumps. These pumps are located in the Underground Storage Tank and are controlled by a "control relay". The dispenser sends the signal to the control relay to energize the submerged pump. Consult with the submerged pump manufacturer for more information on control relay boxes.

Connect the "Motor Out" power wire between the dispenser and the control relay box as follows:

Submerged Pump Motor Control — Connect to terminal 3 of the terminal strip located in the electronics enclosure. This should be a 14 ga. wire. It is recommended that the installer use a blue wire for submerged pump motor control. Refer to the Remote Power Wiring Diagram section of this manual.

Note - Select Submerged Pump control or Suction Pump control by setting a jumper wire on the CPU. Make sure that there is a jumper from P1 to P2 on the CPU if controlling a submerged pump relay. This will be set at the factory.

Installing RC Networks

RC NETWORKS - For Submerged pump systems.
An RC Network is an electrical noise suppression device. It is used on AC power devices such as coils and across relay contacts. When AC voltage is applied to coils they are converted to electromagnets. Coils are used to operate AC devices, such as solenoid dispensing valves and AC power relays or contactors. When the AC power is removed from a coil, the electromagnetic field collapses. This causes an AC voltage spike as high as 1500 VAC which can affect electronic systems.
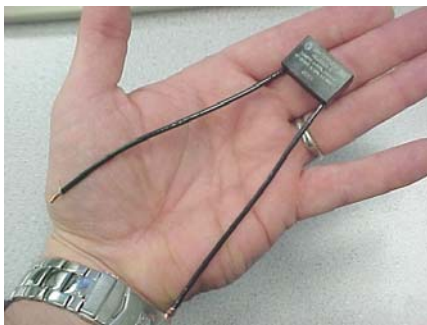
Install the three RC Networks in the Control Relay Box across the following (Refer to the Remote Power Wiring Diagram in the Wiring Section of this manual):

Across Coil to Neutral
Across M1 to L1
Across M2 to L2

*   Check local code requirements concerning complete disconnect of submerged pump voltages. RC Networks will allow voltage to be present at all times.

Connecting Pump Motor Power for Suction Pump Systems

 Self-contained dispensers have the pump motor mounted in the lower hydraulic area. The power is passed to the pump motor using the pump motor relay located on the CPU board in the electronic enclosure.

*****Suction motor connections are pre-wired to the terminal block from the factory. Please refer to the Self Contained Power Wiring Section of this manual.**

Note - Select Submerged Pump control or Suction Pump control by setting a jumper wire on the CPU. Make sure that there is **NO** jumper from P1 to P2 on the CPU board if controlling a suction pump motor. This will be set at the factory.

Connecting the Communication Wires

For the *RS-485* communication wires, use 18 gauge, twisted wires at 8 twists per foot. Refer to the RS-485 Wiring Diagram in the wiring section of this manual. Connect the RS485 communication wires to TS1 on the CPU as follows:

TS1 - 5   RS485 Positive (+) Yellow 18 ga.
TS1 - 6   RS485 Common Brown 18 ga.
TS1 - 7   RS485 Negative (-) Orange 18 ga.

Connecting Field Wiring to the Mechanical Interface Pulse Output Board

Mechanical Mode - Mechanical Mode allows the 100 series to imitate a mechanical dispenser and interface to a fleet system. It also allows pulse output communication with a tank gauge.

A separate Mechanical Pulse Output Interface Board is required for the dispenser. The Pulse Output board can output two channels of pulse information for a fleet system, tank gauge, handle switch output for pump "in use" signal, and an input for an "authorization" signal. The mechanical interface board is mounted on the deck inside the electronics enclosure. This mechanical interface board also communicates with the CPU board. Read and understand the following information to interface the Pulse Output board to a fleet system.

Pulse Output - The pulse output allows the mechanical interface to send pulse information to the console and the Tank Gauge. The system can be programmed to output pulse ratios from 1:1, 10:1, 100:1, and 1000:1. The Fleet System connected to the dispenser must provide 5-12 volts DC for the pulse output channel. The pulse output rate is determined with jumpers on the Pulse Output Board.

Refer to the Pulse Output Wiring Diagram in the back of this manual and the table below to see how to wire to the Pulse Output Board.

Handle Switch Signal— The handle switch signal can be used to signal the console that the pump is "in use". Some Fleet Systems require this signal and some do not. Refer to the Pulse Output Wiring Diagram in the back of this manual and the table below to see how to wire the handle switch signals.

Authorization Signal - A Fleet System can send "authorization" to a fueling point (in the form of a 110 volt signal) which allows the fueling point to reset at the beginning of the sale. Without this signal, the dispenser will not reset when in the "Mechanical" mode. Refer to the Pulse Output Wiring Diagram in the back of this manual and the table below to see how to wire the Authorization signals.

Tank Gauge Pulse Output Signals - The dispenser electronics Pulse Output Board can send pulse information to the electronic Tank Gauge system so that it may reconcile dispensed product. The system can be programmed to output pulse ratios from 1:1, 10:1, 100:1, and 1000:1. The Tank Gauge system connected to the dispenser must provide 5-12 volts DC for the pulse output channel. Refer to the Pulse Output Wiring Diagram in the back of this manual and the table below to see how to wire the Tank Gauge signals.
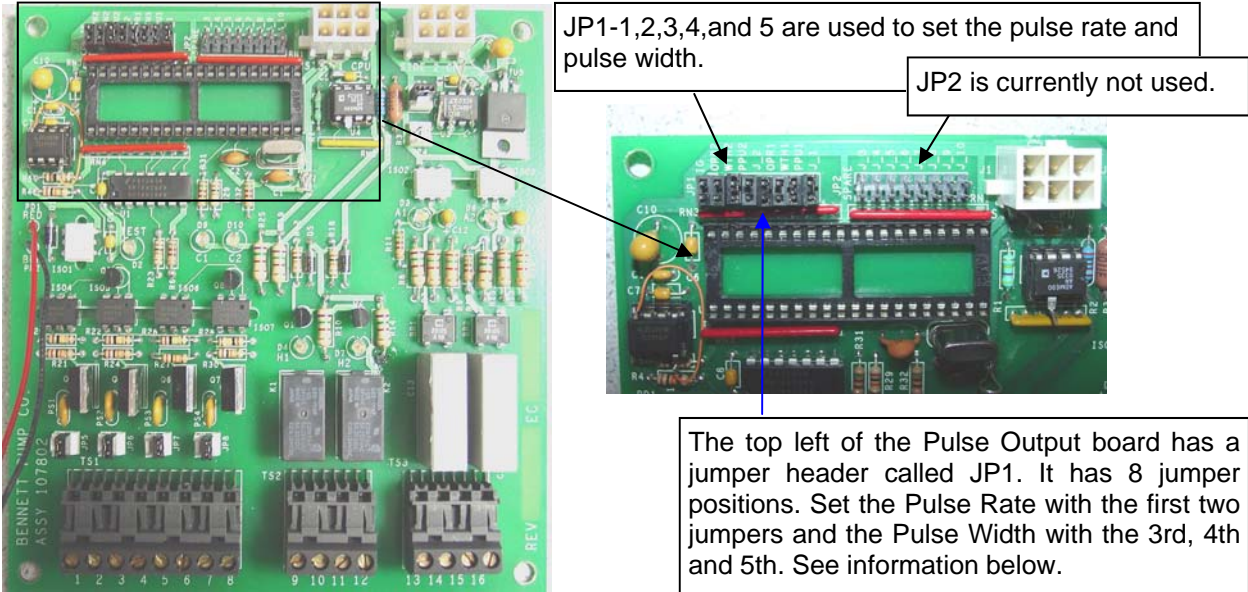
Pulse Output Field Wiring Table
(Also refer to the Pulse Output Wiring Diagram)

Name	Color	Wire Size	Board Connection
Authorization	Orange	18 Ga.	TS3 - 13 Pulse Output Board
Neutral	White	18 Ga.	TS3-14 Pulse Output Board
Pulse Output (+)	Red	18 Ga.	TS1-1 Pulse Output Board
Pulse Output (-)	Brown	18 Ga.	TS1-2 Pulse Output Board
Tank Gauge (+)	Gray	18 Ga.	TS1-3 Pulse Output Board
Tank Gauge (-)	Pink	18 Ga.	TS1-4 Pulse Output Board
Handle (+)	Violet	18 Ga.	TS2-9 Pulse Output Board
Handle (-)	Violet	18 Ga.	TS2-10 Pulse Output Board

Setting the Jumpers on the Pulse Output Board

The Pulse Output board is ordered as an option with the Electronic 100 series. This board is where the field wires connect the 3rd party Fleet System to the Pulse Output functions of the dispenser. This board also has jumpers that need to be set to determine the Pulse Rate and the Pulse Width. Whatever pulse rate is set will send the same pulse rate and width to both the Fleet System and the Tank Gauge (if one is connected). This section describes how to set these jumpers. Refer to the Figures below:

JP1-1,2,3,4,and 5 are used to set the pulse rate and pulse width.

JP2 is currently not used.

The top left of the Pulse Output board has a jumper header called JP1. It has 8 jumper positions. Set the Pulse Rate with the first two jumpers and the Pulse Width with the 3rd, 4th and 5th. See information below.

This is the Pulse Output Board. It has the terminal strips for the field wire connections along the bottom of the board to communicate with the Fleet System using a pump handle output signal, an authorize input signal and a pulse train signal. The Jumper Header JP1 is at the top left of the board. These jumpers must be set to determine the pulse *rate* and the pulse *width*. See information below.

To set the **Pulse Rate Output,** set jumpers JP1-1 and JP1-2 as follows:

JP1-1	JP1-2	Pulses Per Gallon	Pulses Per Liter
OUT	OUT	1000	100
IN	OUT	100	10
OUT	IN	10	1
IN	IN	1	1/10TH

To set **Pulse Width,** set jumpers JP1-3, JP1-4, JP1-5 as follows (PULSE WIDTH'S ARE IN MILLISECONDS):

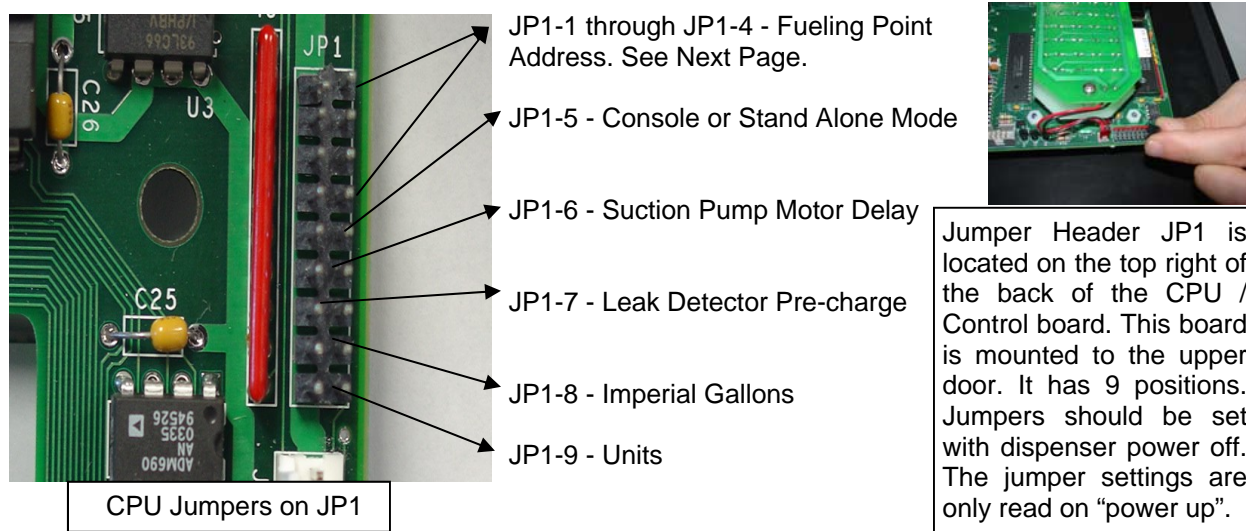| JP1-3	JP1-4	JP1-5	Pulse Width	Pulses Per Minute
OUT	OUT	OUT	.5 ms	60000
IN	OUT	OUT	1 ms	30000
OUT	IN	OUT	2 ms	15000
IN	IN	OUT	4 ms	7500
OUT	OUT	IN	8 ms	3750
IN	OUT	IN	16 ms	1875
OUT	IN	IN	32 ms	9378
IN	IN	IN	64 ms	467

CPU Board Jumper Configuration

The 100 Series can operate in two different modes, *Console* or *Stand Alone*, **which must also be defined by jumper settings on the CPU board:**

Stand Alone Mode -Stand Alone mode allows the 100 Series to operate without being connected to a console or control device. In this mode, when the handle is turned "on" the dispenser authorizes itself.
Console Mode - Console mode allows the 100 Series to communicate with compatible consoles or control devices using a RS485 communication data loop. Also, the dispenser is set for *Console mode* when operating in mechanical mode with a Pulse Output board to a Fleet System.
Mechanical Mode - Mechanical mode allows the 100 Series to imitate a mechanical pump and interface to a Fleet System. For this type of interface, a separate "pulse output" board must be ordered with the system and the *Console* mode must be selected. So, to put the system into "Mechanical Mode", install a **Pulse Output Board** and Select the **Console Mode** with the jumper. The field wires between the Fleet System and the dispenser would be connected to the Pulse Output Board. This board would be used to output pulse data, handle switch status information and would receive authorization signals from the Fleet System. When setting the system up to imitate a mechanical dispenser, select *CONSOLE* mode. See the following section. The 100 series dispensers are programmed using "jumpers" or "shunts". The jumper header JP1 is a 9 position header and is located on the top right corner on the back of the CPU/ Board. **This jumper header is used to program the dispenser**. Jumper configuration changes may be required on the CPU circuit board at the site. See the chart below for a quick reference of what the jumpers do. See the next page for an explanation of each jumper setting.

JP1-1 through JP1-4 - Fueling Point Address. See Next Page.

JP1-5 - Console or Stand Alone Mode

JP1-6 - Suction Pump Motor Delay

JP1-7 - Leak Detector Pre-charge

JP1-8 - Imperial Gallons

JP1-9 - Units

CPU Jumpers on JP1

Jumper Header JP1 is located on the top right of the back of the CPU / Control board. This board is mounted to the upper door. It has 9 positions. Jumpers should be set with dispenser power off. The jumper settings are only read on "power up".

Console Mode—Setting Jumpers

The 100 Series is shipped from the factory configured for the console mode of operation. In the "Console" mode, the 100 Series electronic commercial dispenser can communicate with any console that can communicate using RS485 communication. It is also set for Console when using the mechanical interface pulse output board. When in the "Console" mode, after the handle is lifted, the dispenser must receive the "authorization" command from the console or controlling device before the dispenser resets and begins the sale.

Jumper Header JP1 is a 9 position jumper header. Position 5 is for setting the dispenser in the Console or Stand Alone mode. Placing the jumper across the pins on position 5 puts the dispenser in Console mode.

This jumper configures the CPU for RS485 output on TS1 or J7 (Connection to Console or Pulse Output Board).

       TS1-1 = DATA (–)
       TS1-2 = DATA (Common)
       TS1-3 = Data (+)

Stand Alone Mode - Setting Jumpers

In the Stand Alone mode, the dispenser does not require an outside "authorization" signal from any console or control unit. When the handle is lifted, the dispenser "authorizes" itself and the dispenser resets and the sale begins.

Jumper Header JP1 is a 9 pin jumper header. Position 5 is for putting the dispenser in the "Stand Alone" or "Console" mode. Removing the jumper from JP1 position 5 puts the dispenser in the Stand Alone mode.

Setting the jumpers- The jumpers should be set with power off and are only "read" at boot-up (power up).

WARNING - DO NOT SET OR REMOVE JUMPERS WITH DISPENSER POWER TURNED ON! DAMAGE TO THE DISPENSER MAY RESULT. ALWAYS MAKE SURE DISPENSER POWER IS OFF WHEN ADDING OR REMOVING JUMPERS!

The 9 position Jumper Header is located on the CPU board. It is used to set the hose position address and to program the dispenser.

Jumper positions 1 - 4 - (Fueling Point Address - Up to 16 fueling position addresses). Use jumper positions 1 through 4 to set the dispenser address. Normally, Bennett pumps do not need an address set when using current loop communications, but, with this RS485 style communication, an address must be set for the 3rd party device or console to know which fueling point it is talking to. The first four rows of pins (on jumper header JP1) represent a binary number whose greatest value is 16 (or 0-15 if preferred). The fueling point address must be set to identify each hose position / fueling point using these jumpers. See the chart on the next page for details on how to set the address for a specific fueling point number using the jumpers on the first four rows of jumper header JP-1. *****Note: When using the Mechanical Pulse Output Board, these jumpers will be in the open position (Fuel Position 1)**

Jumper position 5 - Console or Stand Alone -
In - Console (or Mechanical)
Out - Stand Alone

Jumper Position 6 - This function allows a 2 second delay preventing the dispenser from turning on immediately when the pump handle is lifted. This would be used on a dispenser with self contained pumps and no valves. Set the dispenser for the 9 second delay so that the motor does not come on immediately when the handle is lifted, allowing the dispenser to pump through a hose without a valve before the dispenser resets.
In - 9 second delay
Out - 2 second delay

Jumper Position 7 - Leak Detector Pre-charge—This function allows the system to energize the submerged pump pressurizing the line to check for leaks before the valve opens. The jumper should be out in most cases unless the leak detectors routinely trip (very slow flow from the nozzle– then use 9 seconds).
In - 9 seconds
Out - 2 seconds

Jumper Position 8 - Imperial Gallons
In - Imperial Gallons
Out - Gallons

Jumper Position 9 - Units
In—Liters
Out - Gallons

	Position 8	Position 9
Imperial Gallons	**In**	**Out**
Gallons	Out	Out
Liters	Out	In

Using Jumpers 8 & 9 to set Gallons or Liters.

Circuit Board Jumper Configuration Diagram

Jumper Header JP1 on the CPU board is used to program the dispenser and to set the hose position address. The first 4 rows are used to set the hose position address. Addresses from 1—16 are available. Here is how to set the address using the first four rows of the Jumper Header.
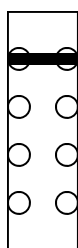
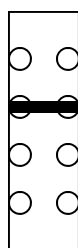JP1 header - First four rows - Top of Board ↑
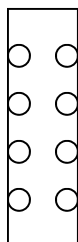
Row 1
Row 2
Row 3
Row 4

Setting the Fueling Point Address using jumpers on jumper header JP1 top right corner of the CPU/Control Board. The dark line indicates the shunt jumper installed.
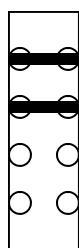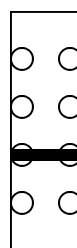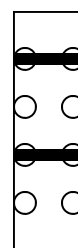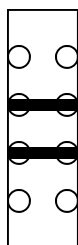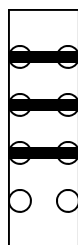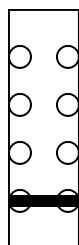
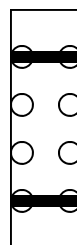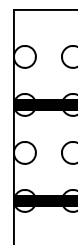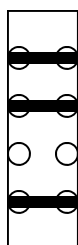Address 1 - No Jumpers

Address 2

Address 3

Address 4

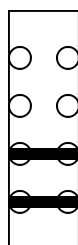Address 5

Address 6

Address 7

Address 8
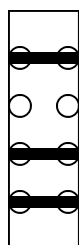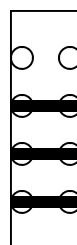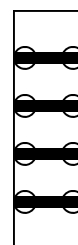
Address 9

Address 10

Address 11

Address 12

Address 13

Address 14

Address 15

Address 16

Dispenser Startup and Checklist

⚠️ **CAUTION: To prevent damage to the dispenser, follow the proper start-up procedures.**

Before applying AC power to the dispenser, follow this procedure:

1.   Unlock and open the upper door and remove the lower dispenser panel.
2.   Verify the following:
   - The boards and other components have not come loose from shipping. LCD display boards are not cracked or damaged.
   - The cables are properly connected to the boards. There are no torn cables or stranded harnesses.
   - Pulser and pump handle harnesses are connected properly to the CPU board.
3.   Make sure the shut off valves are closed. (If applicable)
4.   Turn off all submerged pump circuit breakers and all other circuit breakers to the dispenser.

   Make sure the 12-gauge green ground wire is properly connected and measures 1 ohm (or less) resistance to earth ground. This measurement should be taken between neutral and ground at the dispenser. When taking this measurement, make sure the ground and the neutral are disconnected at the dispenser. This ensures that you are not taking your resistance reading across the electronics on the circuit board. If the resistance reading is more than 1 ohm, the dispenser electronics may not operate properly and will void the Bennett Limited Warranty.

Turn on 115 or 230 volts AC dispenser power to the unit.

1.   Use a voltmeter to verify 115 or 230 Volts AC only at Terminal 2 on TS2 of the CPU board. Terminal 1 of TS2 on the CPU board is Neutral. This AC circuit provides power to the electronic boards.
2.   Make sure displays are normal and not garbled.

⚠️ **WARNING: Make sure all dispenser power circuits for REMOTES ONLY are on the same phase/leg of the breaker panel or damage will result.**

3.   Turn the dispenser power off. Program the dispenser for Stand Alone operation by removing the jumper from JP1 jumper 5 . (Do not loose this jumper because you may need to use it again later). Refer to the previous section for jumper settings. Turn the dispenser power back on.

CHECK THE PUMP MOTOR CIRCUIT

<div align="center">

Remotes

</div>

⚠️ **WARNING: To prevent injury, make sure impact valves and submerged pump breakers are off.**

1.   Turn the 1st dispenser pump handle to the **ON** position. The dispenser display will reset. Use a voltmeter to verify 115 or 230 Volts AC on Terminal 3 on TS2. Use Terminal 1 as neutral.
2.   Turn the 1st dispenser handle to the **OFF** position.
3.   Repeat this process for the remaining dispensers.
4.   Turn on all handles and make sure the dispensers are operating properly. Make sure all dispensers are on the same phase of power. The dispensers should not be on different phases of power.

Dispenser Startup and Checklist (Cont'd)

Self-Contained

Turn on the dispenser circuit breaker. With the pump handle **OFF**, use a voltmeter to verify 115 or 230 Volts AC power for the self contained pump motor. Measure (Hot) "L1" on the terminal block or terminal 4 on TS2 of the CPU between (Neutral) on the terminal block or terminal 1 of TS2 of the CPU board. The pump motor has two wires coming into the dispenser head from the motor. One lead connects to the dispenser terminal block (Motor) (factory connected) and the other lead is connected to the dispenser terminal block (Neutral) (factory connected). The solid state relay for the suction pump motor is located on the CPU board.

All Dispensers

1.   Turn off all circuit breakers.
2.   Close and lock upper doors and install the lower panel.
3.   Turn the circuit breaker for the system on.
4.   Purge the air from the system.
5.   Dispense a small amount of diesel exhaust fluid to verify the display is counting.

Proceed to the section titled "How to Calibrate the DEF Meter".

How to Electronically Calibrate the DEF Meter (E-Cal)

How to set the Electronic Calibration - Electronic calibration is a simple method to calibrate the meters in the dispenser. This method uses a mathematical algorithm in the software to account for meter wear rather than mechanical methods to limit the piston throw within the meter.

This method also eliminates the parts associated with mechanical calibration in the meter. Result is a more symmetrical meter that will be intrinsically more accurate.

Follow these steps to electronically calibrate the meter:

Step 1 - Pump 5 gallons as displayed on the dispenser display into the test can. Make sure to stop pumping at exactly 5.000 gallons.

Step 2 - Read the plus / minus value in the test can.

Step 3 - Unlock and open the electronics door. With the power on, locate the electronic calibration switch on the top of the CPU/Display board (mounted to the door).

Step 4 - Break the seal and move the switch to the calibrate position. Close the door and observe the current calibration value on the display.

Step 5 - Press the "Enter" button along the top edge of the CPU/Display board. The figure on the right shows that there are 3 buttons next to the electronic calibration switch. The functions of the buttons are "Enter", "Up", and "Down". These buttons are used to enter electronic calibration data.

Open the upper door.
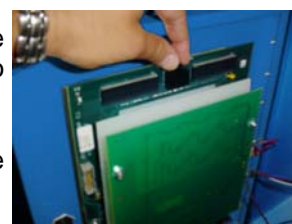
Remove the seal and turn the E-Cal switch "ON".

"Enter", "Up" and "Down" keys used to input data.

How to Electronically Calibrate the DEF Meter (E-Cal) Cont'd

Step 6 - The display should say "tc 000.0". Enter the Test Can size that is being used. This is done by using the "Up" key on the top of the board. (Typically 5 gallons or 20 liters). Press the "Enter" button.

Enter test can sample. In this example - 5 gallons.

Step 7 - Enter the value of the measurement in the test can that the test was above or below. If the test can measurement was "over" by 2 cubic inches, press the "Up" button twice. If the measurement in the test can was "low", for example, -1 cubic inch, change the sign to (-) minus by pressing the "down" button so that the display shows "in –01.0". Press the "Enter" button for the system to accept the information.

Entering a value that represents a test can reading that was "low" by 1 cubic inch. Any low reading (in the test can) will always be input as a negative number.

Step 8 - The system displays a message that shows "Cal On" with the current calibration parameter.

After inputting calibration value, it should show "Cal ON".

Step 9 - Turn the e-cal switch to the "Off" position and reseal. Fill another test can to verify correct calibration.
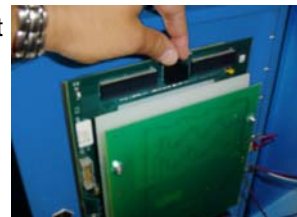
Turn the ecal switch off when you are done.

Wiring the 200 Series Dispenser
Retail Computers

See General Wiring Requirements on pages **11,12**

Determining the Number of Wires Needed

The 210 Retail electronics package in the 200 series unit is a very simple design. There will be one "control" (CPU) board. This control board is where the field wires will connect if utilizing a remote (submerged) pump. The field wires will connect to a 10 pin terminal strip if the dispenser is equipped with a suction unit utilizing a flow sensor.

Step 1. Dispenser Power - Every 200 series model requires these wires:

> (1) 12ga. ground wire (Green)
> (1) 14ga L1 (hot) power wire for electronics power. (Black)
> (1) 14ga. Neutral wire. (White)

Step 2. Console Communications -For communications, the 210 electronics can communicate using 2 wire *current loop* or 3 wire *RS-485*. If the dispenser is to be connected to a control console using the **Current Loop protocol**, remote communication wires will be needed. Run 2 separate wires for each current loop channel. Refer to the Current Loop Communication Wiring Section of this manual and follow these guidelines:

Current Loop - For each Hose Position (CPU):

> (1) 18ga. wire for communication positive. (Yellow)
> (1) 18ga. wire for communications negative. (Orange)

> *Note - Follow the recommended color coding found in the wiring diagram.

RS-485 protocol - When using RS - 485 communication, 3 communication wires will be needed for each dispenser. Refer to the RS- 485 Communication Wiring Diagram.

To side 1 Product "A" only (CPU):

> (1) 18ga. wire for RS-485 communication positive. (Yellow)
> (1) 18ga. wire for RS-485 communications negative. (Orange)
> (1) 18ga. Wire for RS-485 communication common. (Brown)

Note - Use twisted wires for the communication wiring at 8 twists per foot. Warranty will be void if wire is not twisted together. Please refer to the RS485 Communication Wiring Diagram located in the Wiring Section of this manual.

Step 3. Remote Dispensers (Submerged Pump) -a remote relay control wire will be required for each dispenser. Please refer to the Remote Power Wiring Diagram located in the wiring section of this manual.

> (1) 14ga. motor control wire. (Blue)

Determining the Number of Wires Needed (Cont'd)

Step 4. Self-Contained (Suction Pump)- Additional wires are not necessary. Suction pumps share power with the electronics through the 10 pin terminal strip. Please refer to the Self Contained Power Wiring Diagram located in the wiring section of this manual.

Step 5. **Mechanical Pulse Output -** If the dispenser is to be wired to a **Mechanical Interface Card/Key system,** the following wires will be needed. A **Bennett Pulse Output Board** is required. Field wiring will be connected between this board and the third party interface system. This board will be mounted on the deck inside the electronics enclosure. Please refer to the Pulse Output Wiring
Diagram located in the Wiring Section of this manual.

> **(2) Pulse output wires (+) and (-) 18 ga. ***
> **(2) Pulse output wires for tank gauge interface (+) and (-) 18 ga. (If applicable)**
> **(2) Handle circuit wires (+) and (-) 18 ga. ***
> **(1) Authorization wires (+) and (-) 18 ga. ***

Note - The Installer should following the recommended color coding for field wires found in the Pulse Output Wiring Diagram section of this manual.

Pulling the Field Wires

Open the lower panel on the dispenser and locate the electrical conduit inlet. The conduit inlet is located on side 2 on the bottom left corner. This is where the conduit and all of the field wires will be pulled into the Electronics enclosure. Side 1 of the dispenser is the side with the serial plate on the inside deck. Pull the dispenser wires through the conduit and into the upper electronic enclosure. Make sure that the copper ends of the wires are clean and free of oxidation.

Electrical contractors must pull 60" of wire above the grade level to reach through the dispenser's conduit and into the electrical area at the top of the dispenser. Read and follow all instructions on the wiring diagram and observe all national and local electrical codes.

Proper Equipment Grounding

INSTRUCTIONS FOR EARTH GROUNDING THE EQUIPMENT

⚠️ **WARNING: Failure to properly ground the equipment can cause injury or damage to the equipment and will void the Bennett limited warranty.**

This product must be properly grounded. Each dispenser requires a 12-gauge Green earth ground wire. Grounding provides a path of least resistance for electric current to reduce the risk of electric shock. Grounding is also required to protect the dispenser's computer from external electrical noise generating devices. The ground wire connection must provide 1 ohm (or less) resistance to earth ground. To establish a good earth ground, follow this procedure:

1. Connect a 12-gauge (minimum), green stranded wire to the grounding terminal on the electronics enclosure deck. Only one ground wire is required per dispenser.

2. Pull the wire through the rigid metal conduit and connect it directly to the ground bar of the **MAIN** electrical service panel, not a sub-panel. Do NOT rely on the metal conduits as a ground anywhere in the system.

DO NOT USE WIRE NUTS ON GROUND WIRES. USE COMPRESSION CONNECTORS ONLY.

Do not daisy-chain ground wires. All ground circuits must be dedicated wires connected directly to the ground bar in the main electrical panel. A direct connection to the site's ground rod must be connected to the ground bar in the main electrical panel.

AC Power Installation

Each dispenser uses one 115V or 230V, 50/60 Hz circuit for dispenser power. Make sure the power source has the correct frequency and voltage. The electrical circuit will connect to the terminal strip on the CPU board or the terminal block on the electronics deck. Only one dispenser electronics Hot and Neutral needs to be pulled per dispenser. That power will be shared by the CPU and suction motor (if applicable).

Reference Note: L1 is hot and L2 is Neutral.

Electronic Power Connections: Remote

1. Connect the White (Neutral) 14ga. wire to terminal 1 of TS2 on the CPU board. The CPU board is located on the upper electronics door.
2. Connect the Black (Hot) 14ga. wire to terminal 2 of TS2 on the CPU board.
3. Dispenser power must be connected to a dedicated 15 amp. circuit breaker. Electronic power for all dispensers at an installation must be wired to the same AC line phase or damage from cross phasing will result in the remote sub-pump relay control circuits.

Electronic Power Connections: Self Contained Suction

1. Connect the White (Neutral) 14ga. wire to "NEUTRAL" on the terminal block. The terminal block is located in the upper electronics enclosure.
2. Connect the Black (Hot) 14ga. wire to (Hot) "L1" on the terminal block.

Rules to ensure proper operation:

1. Each dispenser uses one 115V or 230V circuit for dispenser power. Put no more than two dispensers on a circuit breaker.
2. Do not connect any other devices or motors to these circuits.
3. Put the pump wiring in a dedicated separate conduit. Do not put non-pump related wires, such as price signs or intercoms, in the same conduit as pump wiring.
4. Use only 14-gauge stranded gas and oil resistant THHN wire.
5. Do not use wire nuts anywhere in the pump wiring runs.

Connecting Pump Motor Power for Remote Dispensers

CONNECTING THE SUB PUMP CONTROL WIRING FOR REMOTE DISPENSERS -

Remote dispensers require the use of submerged pumps. These pumps are located in the Underground Storage Tank and are controlled by a "control relay". The dispenser sends the signal to the control relay to energize the submerged pump. Check with the submerged pump manufacturer for more information on control relay boxes.

Connect the "Motor Out" power wire between the dispenser and the control relay box as follows:

Submerged Pump Motor Control — .Connect to terminal 3 of the terminal strip located in the electronics enclosure. This should be a 14 ga. wire. It is recommended that the installer use a blue wire for submerged pump motor control. Refer to the Remote Power Wiring Diagram section of this manual.

Note - Select Submerged Pump control or Suction Pump control by setting a jumper wire on the CPU. Make sure that there is a jumper from P1 to P2 on the CPU if controlling a submerged pump relay. This will be set at the factory.

Installing RC Networks

RC NETWORKS - For Submerged pump systems.

An RC Network is an electrical noise suppression device. It is used on AC power devices such as coils and across relay contacts. When AC voltage is applied to coils they are converted to electromagnets. Coils are used to operate AC devices, such as solenoid dispensing valves and AC power relays or contactors. When the AC power is removed from a coil, the electromagnetic field collapses. This causes an AC voltage spike as high as 1500 VAC which can affect electronic systems.
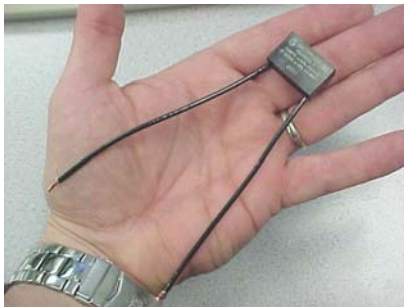
Install the three RC Networks in the Control Relay Box across the following (Refer to the Remote Power Wiring Diagram in the Wiring Section of this manual):

Across Coil to Neutral
Across M1 to L1
Across M2 to L2

*   Check local code requirements concerning complete disconnect of submerged pump voltages. RC Networks will allow voltage to be present at all times.

Connecting Pump Motor Power for Suction Pump Systems

CONNECTING PUMP MOTOR POWER FOR SELF-CONTAINED PUMPS

Self-contained dispensers have the pump motor mounted in the lower hydraulic area. The power is passed to the pump motor using the pump motor relay located on the CPU board in the electronic enclosure.

***Suction motor connections are pre-wired to the terminal block from the factory. Please refer to the Self Contained Power Wiring Section of this manual.

Note - Select Submerged Pump control or Suction Pump control by setting a jumper wire on the CPU. Make sure that there is **NO** jumper from P1 to P2 on the CPU board if controlling a suction pump motor. This will be set at the factory.

Connecting the Communication Wires

For the *RS-485* communication wires, use 18 gauge, twisted wires at 8 twists per foot. Refer to the RS-485 Wiring Diagram in the wiring section of this manual. Connect the RS485 communication wires to TS1 on the CPU as follows:

TS1 - 5   RS-485 Positive (+) Yellow 18 ga.
TS1 - 6   RS-485 Common Brown 18 ga.
TS1 - 7   RS-485 Negative (-) Orange 18 ga.

Connecting the Communication Wires (Cont'd)

For Bennett Current Loop Communication Protocol—For these communication wires, use 18 gauge wire. Connect the current loop communication wires to TS1 on the CPU as follows:

Current Loop Positive (+) to TS1 Terminal 7 on the CPU Board.
Current Loop Negative (-) to TS1 Terminal 5 on the CPU Board.

> Note - Current Loop wiring CANNOT be "daisy chained" so there should be two separate current loop wires for each product / hose position.

Connecting the Field Wiring to the Mechanical Interface Pulse Output Board

Mechanical Mode - Mechanical Mode allows the 200 series to imitate a mechanical dispenser and interface to a fleet system. It also allows pulse output communication with a tank gauge.

A separate Mechanical Pulse Output Interface Board is required for the dispenser. The Pulse Output board can output two channels of pulse information for a fleet system, tank gauge, handle switch output for pump "in use" signal, and an input for an "authorization" signal. The mechanical interface board is mounted on the deck inside the electronics enclosure. This mechanical interface board also communicates with the CPU board. Read and understand the following information to interface the Pulse Output board to a fleet system.

Pulse Output - The pulse output allows the mechanical interface to send pulse information to the console and the Tank Gauge. The system can be programmed to output pulse ratios from 1:1, 10:1, 100:1, and 1000:1. The Fleet System connected to the dispenser must provide 5-12 volts DC for the pulse output channel. The pulse output rate is determined with jumpers on the Pulse Output Board.

Refer to the Pulse Output Wiring Diagram in the back of this manual and the table on the next page to see how to wire to the Pulse Output Board.

Handle Switch Signal— The handle switch signal can be used to signal the console that the pump is "in use". Some Fleet Systems require this signal and some do not. Refer to the Pulse Output Wiring Diagram in the back of this manual and the table on the next page to see how to wire the handle switch signals.

Authorization Signal - A Fleet System can send "authorization" to a fueling point (in the form of a 110 volt signal) which allows the fueling point to reset at the beginning of the sale. Without this signal, the dispenser will not reset when in the "Mechanical" mode. Refer to the Pulse Output Wiring Diagram in the back of this manual and the table on the next page to see how to wire the Authorization signals.

Tank Gauge Pulse Output Signals - The dispenser electronics Pulse Output Board can send pulse information to the electronic Tank Gauge system so that it may reconcile dispensed product. The system can be programmed to output pulse ratios from 1:1, 10:1, 100:1, and 1000:1. The Tank Gauge system connected to the dispenser must provide 5-12 volts DC for the pulse output channel. Refer to the Pulse Output Wiring Diagram in the back of this manual and the table on the next page to see how to wire the Tank Gauge signals.

Pulse Output Field Wiring Table

(Also refer to the Pulse Output Wiring Diagram)

Name	Color	Wire Size	Board Connection
Authorization	Orange	18 Ga.	TS3 - 13 Pulse Output Board
Neutral	White	18 Ga.	TS3-14 Pulse Output Board
Pulse Output (+)	Red	18 Ga.	TS1-1 Pulse Output Board
Pulse Output (-)	Brown	18 Ga.	TS1-2 Pulse Output Board
Tank Gauge (+)	Gray	18 Ga.	TS1-3 Pulse Output Board
Tank Gauge (-)	Pink	18 Ga.	TS1-4 Pulse Output Board
Handle (+)	Violet	18 Ga.	TS2-9 Pulse Output Board
Handle (-)	Violet	18 Ga.	TS2-10 Pulse Output Board

Setting the Jumpers on the Pulse Output Board

The Pulse Output board is ordered as an option with the Electronic 200 series. This board is where the field wires connect the 3rd party Fleet System to the Pulse Output functions of the dispenser. This board also has jumpers that need to be set to determine the Pulse Rate and the Pulse Width. Whatever pulse rate is set will send the same pulse rate and width to both the Fleet System and the Tank Gauge (if one is connected). This section describes how to set these jumpers. Refer to the Figures below:

JP1-1,2,3,4,and 5 are used to set the pulse rate and pulse width.

JP2 is currently not used.

The top left of the Pulse Output board has a jumper header called JP1. It has 8 jumper positions. Set the Pulse Rate with the first two jumpers and the Pulse Width with the 3rd, 4th and 5th. See information below.

This is the Pulse Output Board. It has the terminal strips for the field wire connections along the bottom of the board to communicate with the Fleet System using a pump handle output signal, an authorize input signal and a pulse train signal. The Jumper Header JP1 is at the top left of the board. These jumpers must be set to determine the pulse *rate* and the pulse *width*. See information below.

To set the **Pulse Rate Output,** set jumpers JP1-1 and JP1-2 as follows:

JP1-1	JP1-2	Pulses Per Gallon	Pulses Per Liter
OUT	OUT	1000	100
IN	OUT	100	10
OUT	IN	10	1
IN	IN	1	1/10TH

To set **Pulse Width,** set jumpers JP1-3, JP1-4, JP1-5 as follows (PULSE WIDTH'S ARE IN MILLISECONDS):

JP1-3	JP1-4	JP1-5	Pulse Width	Pulses Per Minute
OUT	OUT	OUT	.5 ms	60000
IN	OUT	OUT	1 ms	30000
OUT	IN	OUT	2 ms	15000
IN	IN	OUT	4 ms	7500
OUT	OUT	IN	8 ms	3750
IN	OUT	IN	16 ms	1875
OUT	IN	IN	32 ms	9378
IN	IN	IN	64 ms	467

Dispenser Startup and Checklist

⚠️ **CAUTION: To prevent damage to the dispenser, follow the proper start-up procedures.**

Before applying AC power to the dispenser, follow this procedure:

1. Unlock and open the upper door and remove the lower dispenser panel.
2. Verify the following:
   - The boards and other components have not come loose from shipping. LCD display boards are not cracked or damaged.
   - The cables are properly connected to the boards. There are no torn cables or stranded harnesses.
   - Pulser and pump handle harnesses are connected properly to the CPU board.
3. Make sure the shut off valves are closed. (If applicable)
4. Turn off all submerged pump circuit breakers and all other circuit breakers to the dispenser.

   Make sure the 12-gauge green ground wire is properly connected and measures 1 ohm (or less) resistance to earth ground. This measurement should be taken between neutral and ground at the dispenser. When taking this measurement, make sure the ground and the neutral are disconnected at the dispenser. This ensures that you are not taking your resistance reading across the electronics on the circuit board. If the resistance reading is more than 1 ohm, the dispenser electronics may not operate properly and will void the Bennett Limited Warranty.

Turn on 115 or 230 Volts AC dispenser power to the unit.

1. Use a voltmeter to verify 115 or 230 Volts AC only at Terminal 2 on TS2 of the CPU board. Terminal 1 of TS2 on the CPU board is Neutral. This AC circuit provides power to the electronic boards.
2. Make sure displays are normal and not garbled.

⚡ **WARNING: Make sure all dispenser power circuits for REMOTES ONLY are on the same phase/leg of the breaker panel or damage will result.**

3. Turn the dispenser power off. Program the dispenser for Stand Alone operation by removing the jumper from JP1 jumper 5 . (Do not lose this jumper because you may need to use it again later). Refer to the previous section for jumper settings. Turn the dispenser power back on.

CHECK THE PUMP MOTOR CIRCUIT

<div align="center">

Remotes

</div>

⚠️ **WARNING: To prevent injury, make sure impact valves and submerged pump breakers are off.**

1. Turn the 1st dispenser pump handle to the **ON** position. The dispenser display will reset. Use a voltmeter to verify 115 or 230 Volts AC on Terminal 3 on TS2. Use Terminal 1 as neutral.
2. Turn the 1st dispenser handle to the **OFF** position.
3. Repeat this process for the remaining dispensers.
4. Turn on all handles for the same product and make sure the dispensers are operating properly. Make sure all dispensers are on the same phase of power. The dispensers should not be on different phases of power.

Dispenser Startup and Checklist (Cont'd)

Self-Contained

Turn on the dispenser circuit breaker. With the pump handle **OFF**, use a voltmeter to verify 115 Volts AC power for the self contained pump motor. Measure (Hot) "L1" on the terminal block or terminal 4 on TS2 of the CPU between (Neutral) on the terminal block or terminal 1 of TS2 of the CPU board. The pump motor has two wires coming into the dispenser head from the motor. One lead connects to the dispenser terminal block (Motor) (factory connected) and the other lead is connected to the dispenser terminal block (Neutral) (factory connected). The solid state relay for the suction pump motor is located on the CPU board.

All Dispensers

1. Turn off all circuit breakers.
2. Close and lock upper doors and install the lower panel.
3. Turn the circuit breaker for the system on.
4. Purge the air from the system.
5. Dispense a small amount of diesel exhaust fluid to verify the display is counting.

    Proceed to the section titled "How to Calibrate the DEF Meter".

How to Electronically Calibrate the DEF Meter (E-Cal)

The basic calibration procedure assumes that the test can sight glass is graduated in units of cubic inches or cubic centimeters (milliliters). If the sight glass is in test can percentage units, refer to the optional calibration procedure in the next section.

1. Under normal dispenser operation, fill a test can to verify proper meter calibration. If the meter is properly calibrated, the procedure is finished.
2. If the meter is out of calibration, write down the amount of the error from the test can sight glass. The error amount should be either cubic inches or cubic centimeters (milliliters).
3. Plug in the Manager Keypad to the J6 connector on the CPU/Control Board. Break the seal on the electronic calibration switch and move the switch to the calibrate position. This brings up the test can size display. This switch is located on the top of the CPU board.
4. With the Manager Keypad enter the size of the test can and press the ENTER button. The test can size ranges from 0.1 to 999.9 volume units. When the test can size is entered, the error amount display appears.
5. Enter the amount of the error recorded previously and press the ENTER button. At this point, another test may be filled for calibration verification by turning on the pump handle. If another test can is not desired, proceed to step 7.
6. If another test can is filled, the error amount display appears as soon as the pump handle is turned off. If the meter is out of calibration, write down the amount of the error from the test can sight glass. Repeat step 5.
7. Move the calibration switch back to the operate position and seal it. Disconnect the Manager Keypad.

How to Electronically Calibrate the DEF Meter (E-Cal)

The Optional Calibration Procedure

The optional calibration procedure assumes that the test can sight glass is graduated in test can percentage units rather than cubic inches or cubic centimeters (milliliters) as in the basic calibration procedure. If the sight glass is in cubic inches or cubic centimeters, refer to the basic calibration procedure in the previous section.

1. Under normal dispenser operation, fill a test can to verify proper meter calibration. If the meter is properly calibrated, the procedure is finished.
2. If the meter is out of calibration, write down the amount of the error from the test can sight glass. The error amount should be a percentage of the test can's volume.
3. Plug in the Manager Keypad to the J6 connector on the CPU/Control Board. Break the seal on the electronic calibration switch and move the switch to the calibrate position. This brings up the test can size display.
4. With the Manager Keypad enter the size of the test can and press the ENTER button. The test can size ranges from 0.1 to 999.9 volume units. When the test can size is entered, the error amount display appears.
5. The default error amount display is for cubic inches or cubic centimeters. To bring up the percent error display, press the UP-ARROW button.
6. Enter the amount of the error recorded previously and press the ENTER button. At this point, another test may be filled for calibration verification by turning on the pump handle. If another test can is not desired, proceed to step 8.
7. If another test can is filled, the error amount display appears as soon as the pump handle is turned off. If the meter is out of calibration, write down the amount of the error from the test can sight glass. Repeat step 6.
8. Move the calibration switch back to the operate position and seal it. Disconnect the Manager Keypad.

The Direct Percent Entry Procedure

The direct percent entry procedure provides a way of zeroing or overwriting the electronic calibration constant. This procedure is not accumulative. The basic and the optional calibration procedures described previously are accumulative. The percent value entered in this procedure becomes the new electronic calibration correction constant for the meter. This procedure requires no test can.

1. Break the seal on the electronic calibration switch and move the switch to the calibrate position. This brings up the test can size display.
2. Press the UP-ARROW button to bring up the electronic calibration correction constant display.
3. Press the +/- button to bring up the percent error display.
4. Enter the percent error amount and press the ENTER button.
5. Move the calibration switch back to the operate position and seal it.

Viewing the Electronic Calibration Correction Constant

The electronic calibration correction constant may be viewed with the electronic calibration switch in either position (calibrate or operate). If the switch is in the calibrate position, the correction constant can be viewed from the test can display by pressing the UP-ARROW button. Pressing the UP-ARROW button a second time returns to the test can display. If the switch is in the operate position, enter manager's mode followed by menu 27 to view the calibration constant.

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Footprint Dimensions & Wiring Diagrams

Find the appropriate footprint dimensional drawings and wiring diagrams for the model of dispenser being installed in the following section of this manual. Read and follow all directions and safety notices.

WARNING: RISK OF ELECTRICAL SHOCK – More than one disconnect switch may be required to de-energize the device for serving.

Note - Dispenser electrical disconnect must comply with National Electrical Code, NFPA 70.

WARNING: All doors must be replaced and locked when unit is in service.

WARNING: Do not operate pump with door removed except when required for maintenance by a Bennett Authorized Service Representative.

DEF 100/200 Series Footprints

## DEF 100/200 SERIES FOOTPRINTS: SELF-CONTAINED AND REMOTE

INSTALLATION NOTES:

A. INSTALLATION MUST BE IN ACCORDANCE WITH NATIONAL ELECTRIC CODE (NFPA 70), THE AUTOMOTIVE AND MARINE SERVICE CODE (NFPA 30A), AND ALL STATE AND LOCAL CODES.
B. USE ONLY UNDERWRITERS LISTED THREADED RIGID CONDUIT AND LISTED SEALING FITTINGS WITH CONDUCTOR SEALS.
C. FIELD CONNECTIONS ARE DONE IN THE UPPER ELECTRICAL ENCLOSURE. WIRE MUST EXTEND 60 INCHES ABOVE BASE OF THE DISPENSER TO MAKE ELECTRICAL CONNECTIONS.
D. SHIMS SHOULD ONLY BE USED UNDER BOLTS TO ENSURE DISPENSER IS LEVEL. IMPROPER SHIMMING THAT RESULTS IN MISALIGNED FRAMES IS **NOT** COVERED UNDER THE BENNETT LIMITED WARRANTY.

DIMENSION NOTES:
1. INSIDE OPENING IN LOWER ENCLOSURE = 8-13/16" x 10-13/16" CONDUIT SIZE = 1/2"
2. 1" BSPP HOSE OUTLET

NOTE:
1. SUBJECT TO CHANGE WITHOUT NOTICE.
2. SOME OPTIONS NOT AVAILABLE ON ALL MODELS

Diesel Exhaust Fluid
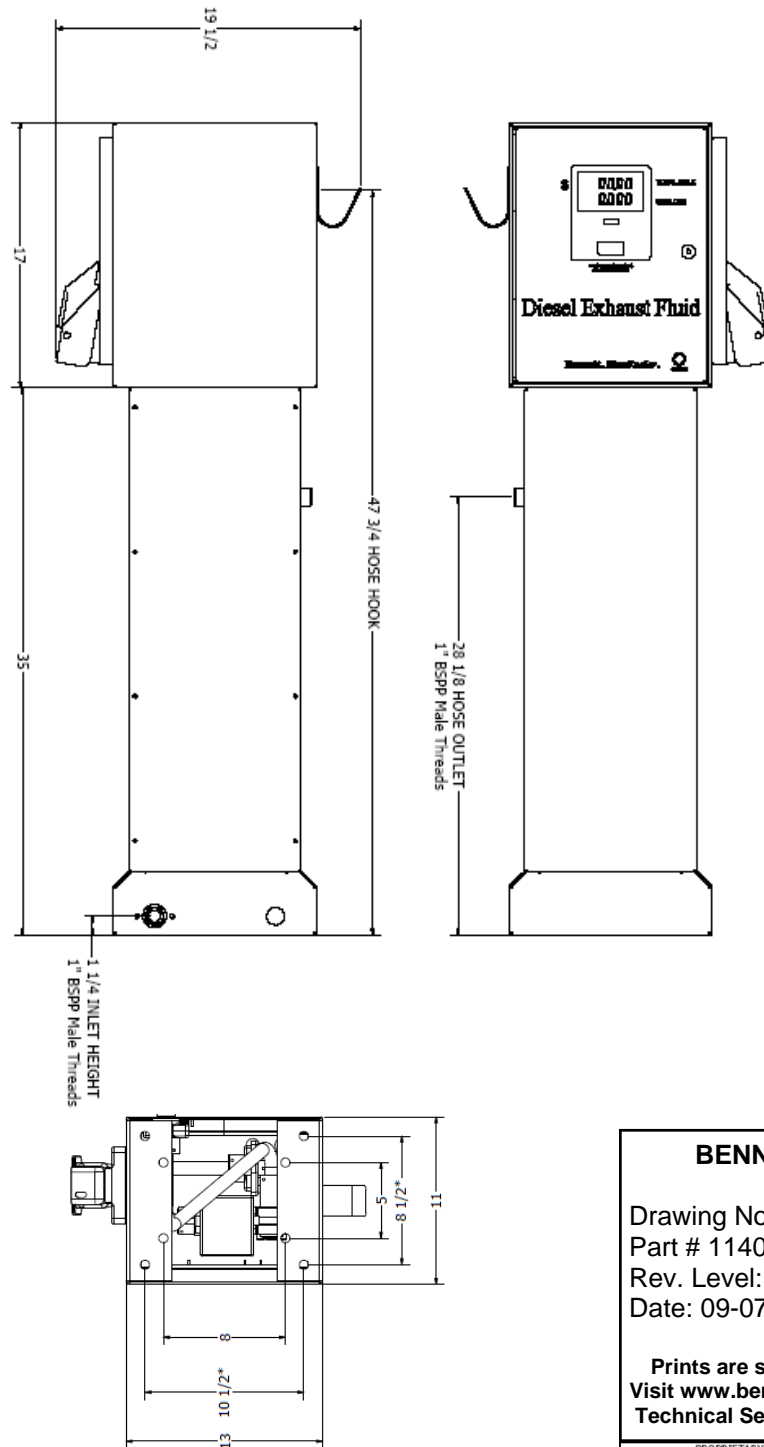
NOTES:
1. SELF-CONTAINED RETAIL MODEL SHOWN
2. REFER TO SHEET 2 FOR HYDRAULIC DETAILS

SHEET 1 OF 2

BENNETT PUMP COMPANY

Drawing No. P2218 Sheet 1
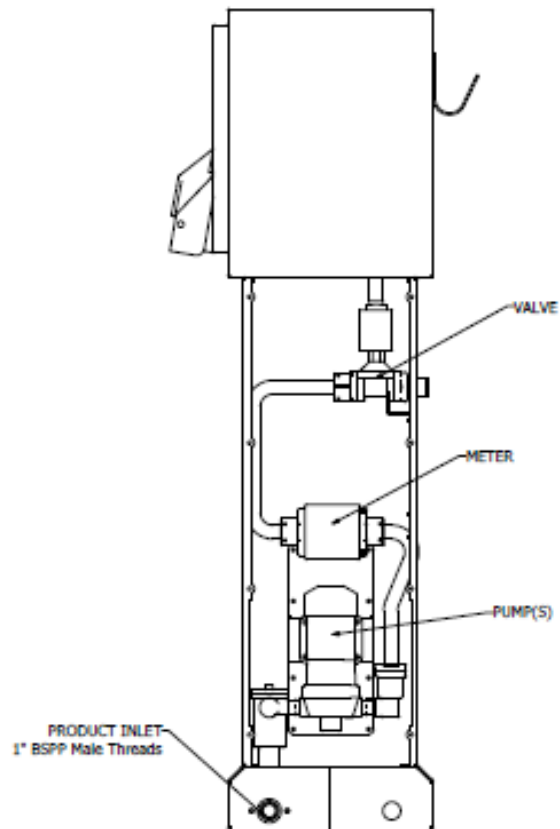Part # 114014
Rev. Level: B
Date: 09-07-10

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Technical Services ~ 800-423-6638 for updates.

113914 Rev B 09/16/10

VALVE

METER

PUMP(S)

PRODUCT INLET-
1" BSPP Male Threads

SELF-CONTAINED

VALVE

METER

PRODUCT INLET-
1" BSPP Male Threads

REMOTE

BENNETT PUMP COMPANY

Drawing No. P2218 Sheet 2
Part # 114014
Rev. Level: B
Date: 09-07-10

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Self Contained Power Wiring Diagram

Notes For Self-Contained Power Wiring Diagram

1. All wiring must be installed and used in accordance with the national electrical code (NFPA #70, Automotive and marine service code NFPA #30A), state and local electrical codes.

2. All wiring gauge is minimum required, stranded wire with THHN insulation must be used. Do not reuse old wire from an existing installation.

3. Pull a Green 12 ga. stranded THHN ground wire through the junction box and wiring trough and secure at grounding post near the terminal strip in the dispenser's electrical enclosure. Terminate the other end at the main electrical service panel ground bar. Do not terminate at the neutral bar of a sub-panel or rely on metal conduit for this ground connection. Each dispenser's grounding post must be within 1 ohm resistance to earth ground potential. Do not use wire nuts on ground circuits, use only compression type connectors. This is required to initiate Bennett's Limited Warranty.

4. Use 15 Amp neutral breaking circuit breakers which are supplied by the customer.
Breaker Identification:
CB #1 Electronic Power – Hot for electronic power is 115 or 230 VAC 50/60 Hz
Note: No more than 2 dispensers per breaker.

5. Valve connections all factory installed
6. Field connection = ⊙

MOTOR 1

GROUND LUG

Main Valve
Definite Valve

Common

210/531

PRODUCT "A"

J4

TS2

TS1

Valve

Push Button

Float Switch

AC POWER & MOTOR
CONNECTIONS FOR DEF 100/ 200 SERIES
SELF CONTAINED PUMPS
WITH 210 OR 531 ELECTRONICS

Neutral

Electronics Power

ELECTRICAL RATINGS

ELECTRONIC POWER	250 WATTS, 115 or 230v 50/60hz
MAIN CONTROL VALVE	15 WATTS, 24 VDC
MOTOR RELAYS	1 H.P., 120 VAC
MOTOR	1/4 H.P., 120 VAC
PUMP HANDLE SWITCH	

P2241

3/4" CONDUIT
(INTO ELEC. HEAD)

A = INTERNAL AC WIRING

BREAKER BOX

ELECTRONIC POWER

HOT

NEUTRAL   CB-1

GREEN 12 GA.
REQUIRED TO INITIATE WARRANTY

BLACK 14 GA.
WHITE 14 GA.

(SEE NOTES 5,6)
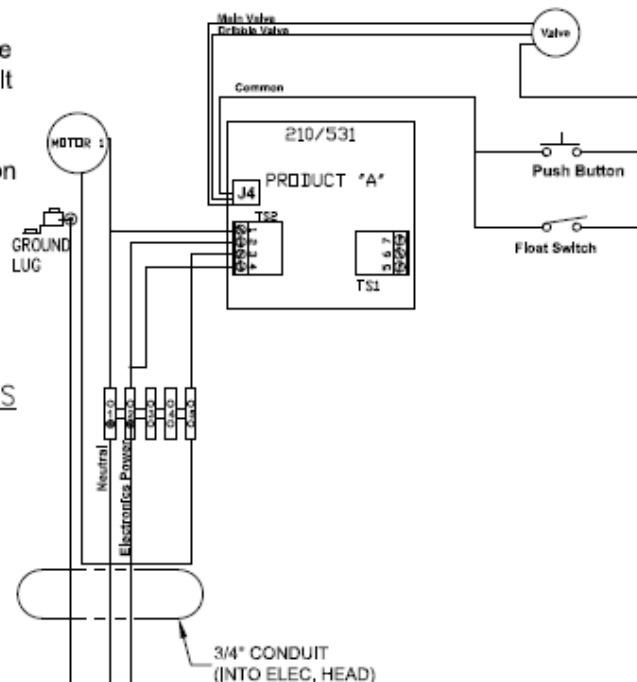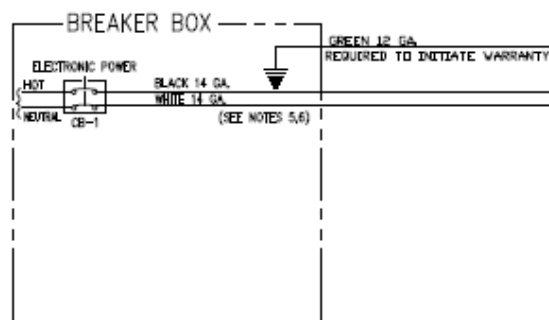
BENNETT PUMP COMPANY

Drawing No. P2241 Sheet 1 View 1
Rev. Level: B
Date: 09-02-10

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for updates.

Remote Power Wiring Diagram

Notes For Remote Power Wiring Diagram

1. All wiring must be installed and used in accordance with the national electrical code (NFPA #70, Automotive and marine service code NFPA #30A), state and local electrical codes.

2. All wiring gauge is minimum required, stranded wire with THHN insulation must be used. Do not reuse old wire from an existing installation.

3. Pull a Green 12 ga. stranded THHN ground wire through the junction box and wiring trough and secure at grounding post near the terminal strip in the dispenser's electrical enclosure. Terminate the other end at the main electrical service panel ground bar. Do not terminate at the neutral bar of a sub-panel or rely on metal conduit for this ground connection. Each dispenser's grounding post must be within 1 ohm resistance to earth ground potential. Do not use wire nuts on ground circuits, use only compression type connectors. This is required to initiate Bennett's Limited Warranty.

4. Electronic power must be a dedicated circuit. The dispenser is factory wired to accept 115 or 230VAC for its operation and may not be changed in the field. (attempting to do this will void the Bennett Limited Warranty) Electronic power for all dispensers at the installation must be wired to the same AC line phase or damage will result to the dispensers. This will avoid a cross phase condition on the remote relay control wires.

5. Use 15 Amp neutral breaking circuit breakers which are supplied by the customer.
Breaker Identification:
CB #1 Electronic Power – Hot for electronic power is 115 or 230VAC.   CB #2 Pump motor product A.
Note: No more than 2 dispensers per breaker. Only 1 submerged pump motor per breaker.

6. The submerged pump relay signals are rated at 30 watts, 115 VAC or 230 VAC maximum. This signal must be wired to an external relay (with all coil control wires for this relay on the same AC phase) for controlling the submerged pump motors. Use Red Jacket or FE Petrol control box or equivalent.

7. Field connection = ⊙

8. All control relays must have a RC networks across the coil and contacts as shown. Use Bennett part number N582401. (Failure to properly suppress relay electrical noise with RC networks will cause system malfunctions and will void the Bennett Limited Warranty.
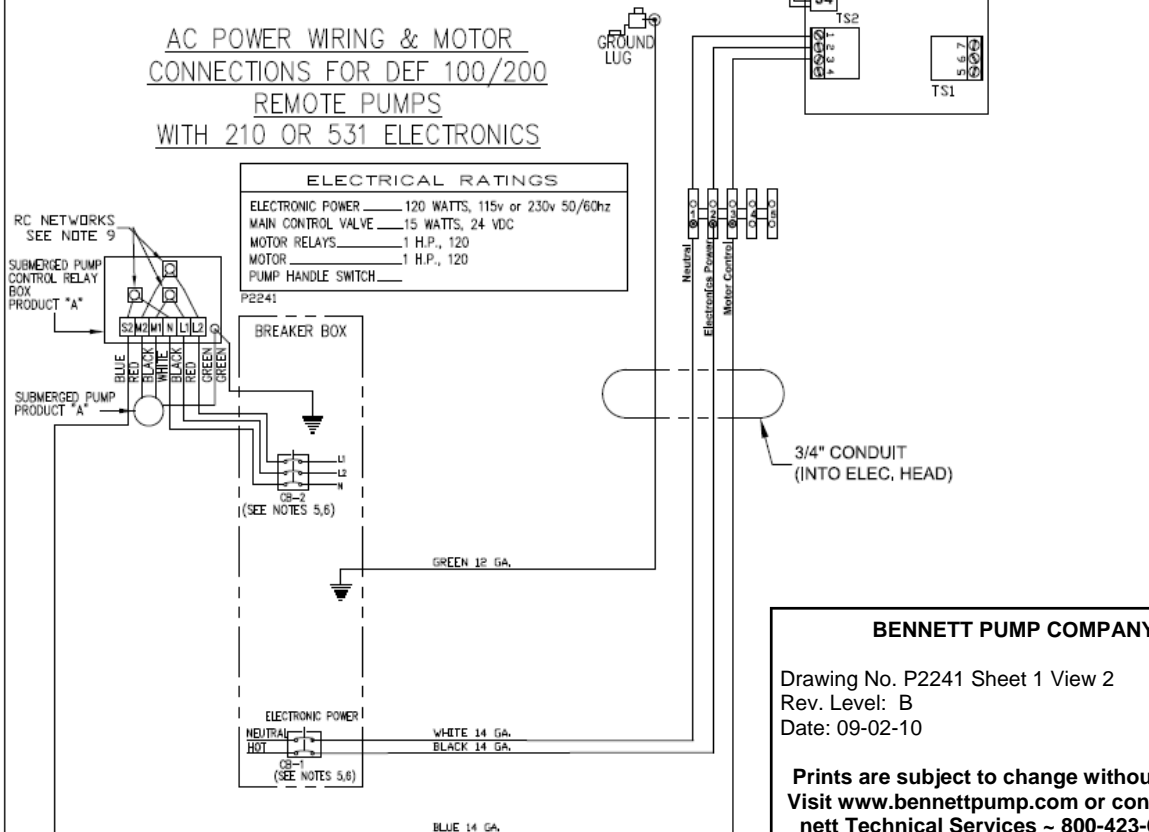

AC POWER WIRING & MOTOR CONNECTIONS FOR DEF 100/200 REMOTE PUMPS WITH 210 OR 531 ELECTRONICS

ELECTRICAL RATINGS

ELECTRONIC POWER	120 WATTS, 115v or 230v 50/60hz
MAIN CONTROL VALVE	15 WATTS, 24 VDC
MOTOR RELAYS	1 H.P., 120
MOTOR	1 H.P., 120
PUMP HANDLE SWITCH	

P2241

BENNETT PUMP COMPANY

Drawing No. P2241 Sheet 1 View 2
Rev. Level: B
Date: 09-02-10

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Pulse Output Board (Optional)

Notes to Installer: System Operation -
If the dispenser was ordered with the "Pulse Output" function, a Pulse Output Board will be installed in the dispenser.

The pulse output board is field wired to the 3rd party Fleet Control System as shown in the diagram to the right.

The P.O.B. is mounted horizontally on top of the Barrier Circuit (cover) inside the head of the dispenser.
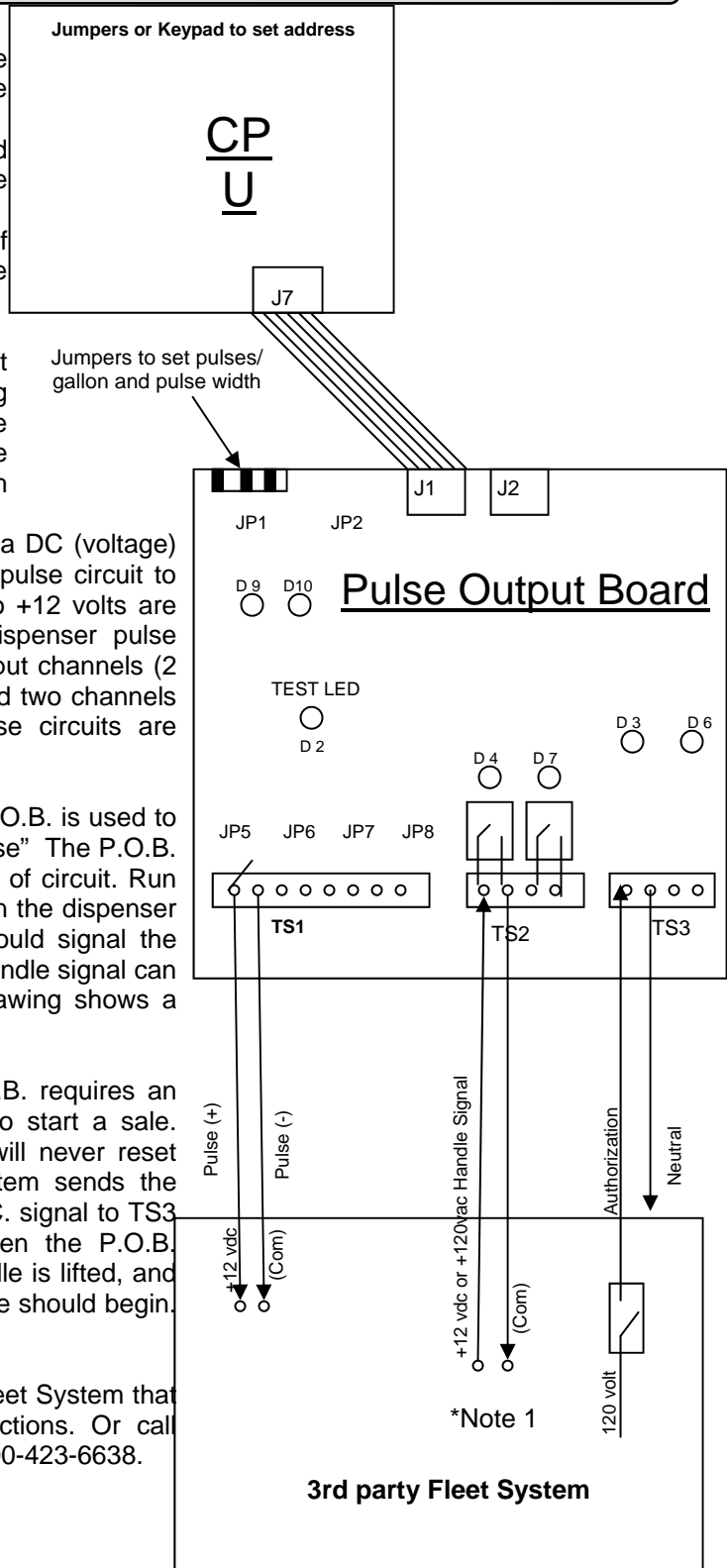
Pulse output - The dispenser can output pulses to the 3rd party Fleet System depending on how the dispenser is programmed. Pulse rates of 1:1, 10:1, 100:1 and 1000:1 are available. When wiring to the 3rd party system please keep the following in mind:

The 3rd part fleet system must be set up for a DC (voltage) input and it must provide the voltage for the pulse circuit to the dispenser. Voltages in the range of +5 to +12 volts are required. Voltage is not provided by the dispenser pulse output circuit. Also, TS1 provides 4 pulse output channels (2 pulse outputs to the 3rd party fleet system and two channels to an electronic tank gauge). All 4 of these circuits are identical.

Handle Circuit - The handle signal on the P.O.B. is used to signal the Fleet System that the pump is "In Use" The P.O.B. uses a dry contact (normally open) relay type of circuit. Run two wires from the Fleet System to TS2. When the dispenser handle is lifted this relay will close. This should signal the Fleet System that the pump is "In Use". The handle signal can be an A.C. voltage or D.C. voltage. This drawing shows a D.C. voltage as an example.

Authorization Signal - The dispenser P.O.B. requires an authorization signal from the Fleet System to start a sale. Without this authorization signal, the pump will never reset and the sale will not begin. The Fleet System sends the authorization signal in the form of 120 volt A.C. signal to TS3 as shown in the diagram to the right. When the P.O.B. receives the authorization signal and the handle is lifted, and the dispenser is programmed properly, the sale should begin.

Wiring to the Fleet System - refer to the Fleet System that you are connecting to for installation instructions. Or call Bennett Technical Support for assistance. 1-800-423-6638.

Jumpers or Keypad to set address

CP
U

J7

Jumpers to set pulses/ gallon and pulse width

JP1   JP2

J1   J2

D 9   D10   Pulse Output Board

TEST LED

D 2   D 4   D 7   D 3   D 6

JP5   JP6   JP7   JP8

TS1   TS2   TS3

Pulse (+)

Pulse (-)

+12 vdc or +120vac Handle Signal

Authorization

Neutral

+12 vdc

(Com)

+12 vdc or +120vac

(Com)

120 volt

*Note 1

3rd party Fleet System

Note 1 - The handle signal can be an A.C. voltage or a D.C. voltage but, must come from the Fleet System. This board only provides a switch relay.
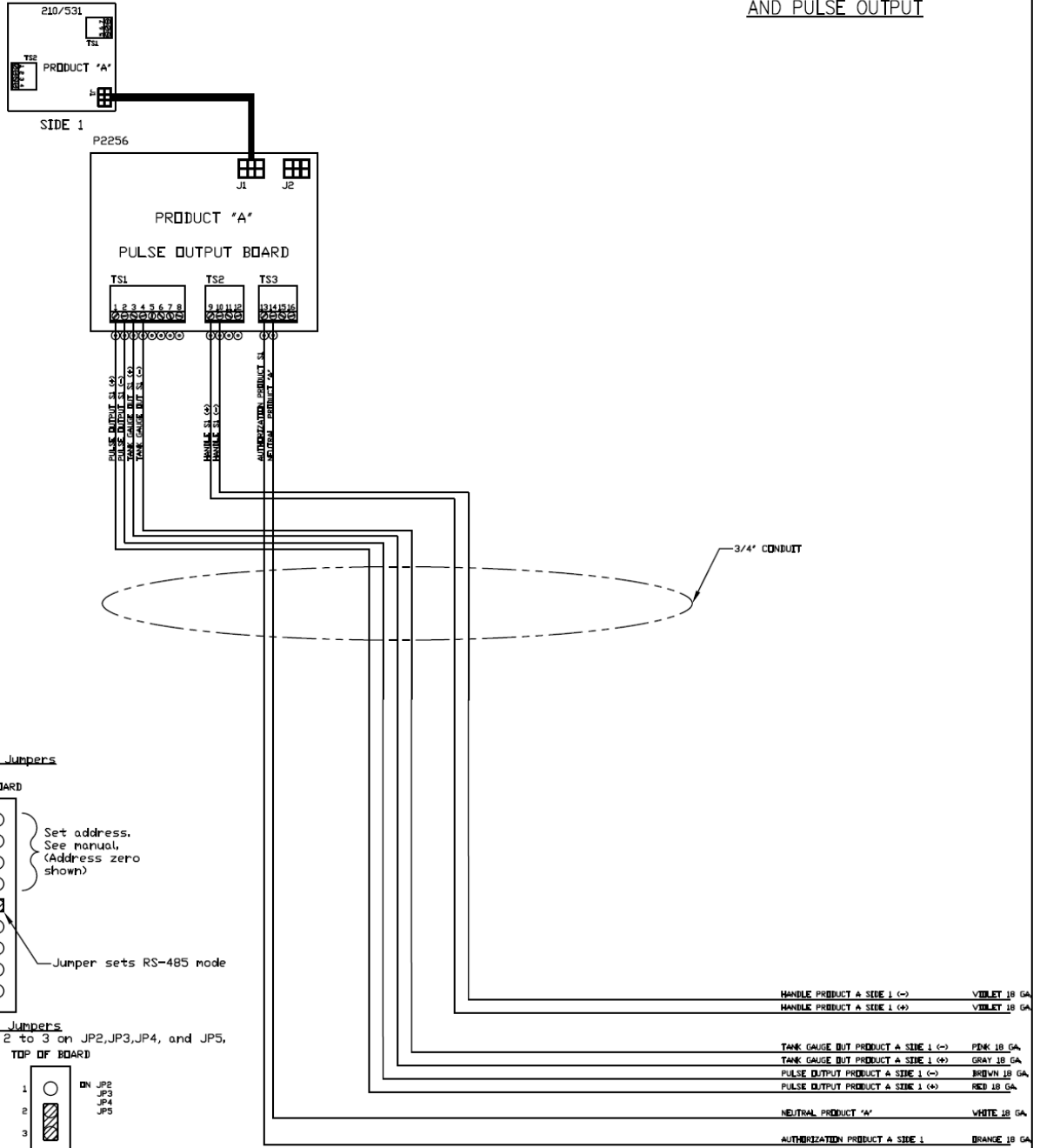
Pulse Output Wiring Diagram

Notes For Pulse Output Wiring Diagram

1. All wiring must be installed and used in accordance with the national electrical code (NFPA #70, Automotive and marine service code NFPA #30A), state and local electrical codes.

2. All wiring gauge is minimum required, stranded wire with THHN insulation must be used. Do not reuse old wire from an existing installation.

3. Do not use PVC conduit. Use only rigid metal conduit.

4. Absolutely no daisy chaining of data wires. Damage to the dispenser or console will result. Do not connect these wires if unit is used without a console.

5. Field connection = ⊙

WIRING & INSTALLATION FOR
DEF SERIES
WITH 210 OR 531 ELECTRONICS
AND PULSE OUTPUT

210/531
TS1
TS2
PRODUCT "A"
SIDE 1

P2256
J1   J2

PRODUCT "A"
PULSE OUTPUT BOARD

TS1   TS2   TS3
1 2 3 4 5 6 7 8   9 10 11 12   13 14 15 16

3/4" CONDUIT

531 Required Jumpers

TOP OF BOARD

1 ○ ○
2 ○ ○   Set address.
3 ○ ○   See manual.
4 ○ ○   (Address zero shown)
5 ▨ ○
6 ○ ○
7 ○ ○   Jumper sets RS-485 mode
8 ○ ○
9 ○ ○

210 Required Jumpers
Jumper pins 2 to 3 on JP2,JP3,JP4, and JP5.
Example: TOP OF BOARD

1 ○   ON JP2
            JP3
2 ▨   JP4
            JP5
3 ▨

Set menu code 21 to RS-485 operation.
Set menu code 22 to zero address.

HANDLE PRODUCT A SIDE 1 (−)	VIOLET 18 GA
HANDLE PRODUCT A SIDE 1 (+)	VIOLET 18 GA
TANK GAUGE OUT PRODUCT A SIDE 1 (−)	PINK 18 GA
TANK GAUGE OUT PRODUCT A SIDE 1 (+)	GRAY 18 GA
PULSE OUTPUT PRODUCT A SIDE 1 (−)	BROWN 18 GA
PULSE OUTPUT PRODUCT A SIDE 1 (+)	RED 18 GA
NEUTRAL PRODUCT "A"	WHITE 18 GA
AUTHORIZATION PRODUCT A SIDE 1	ORANGE 18 GA

RS-485 Wiring Diagram (Supporting Consoles)

Notes For RS-485 Communication Wiring Diagram

1. All wiring must be installed and used in accordance with the national electrical code (NFPA #70, Automotive and marine service code NFPA #30A), state and local electrical codes.
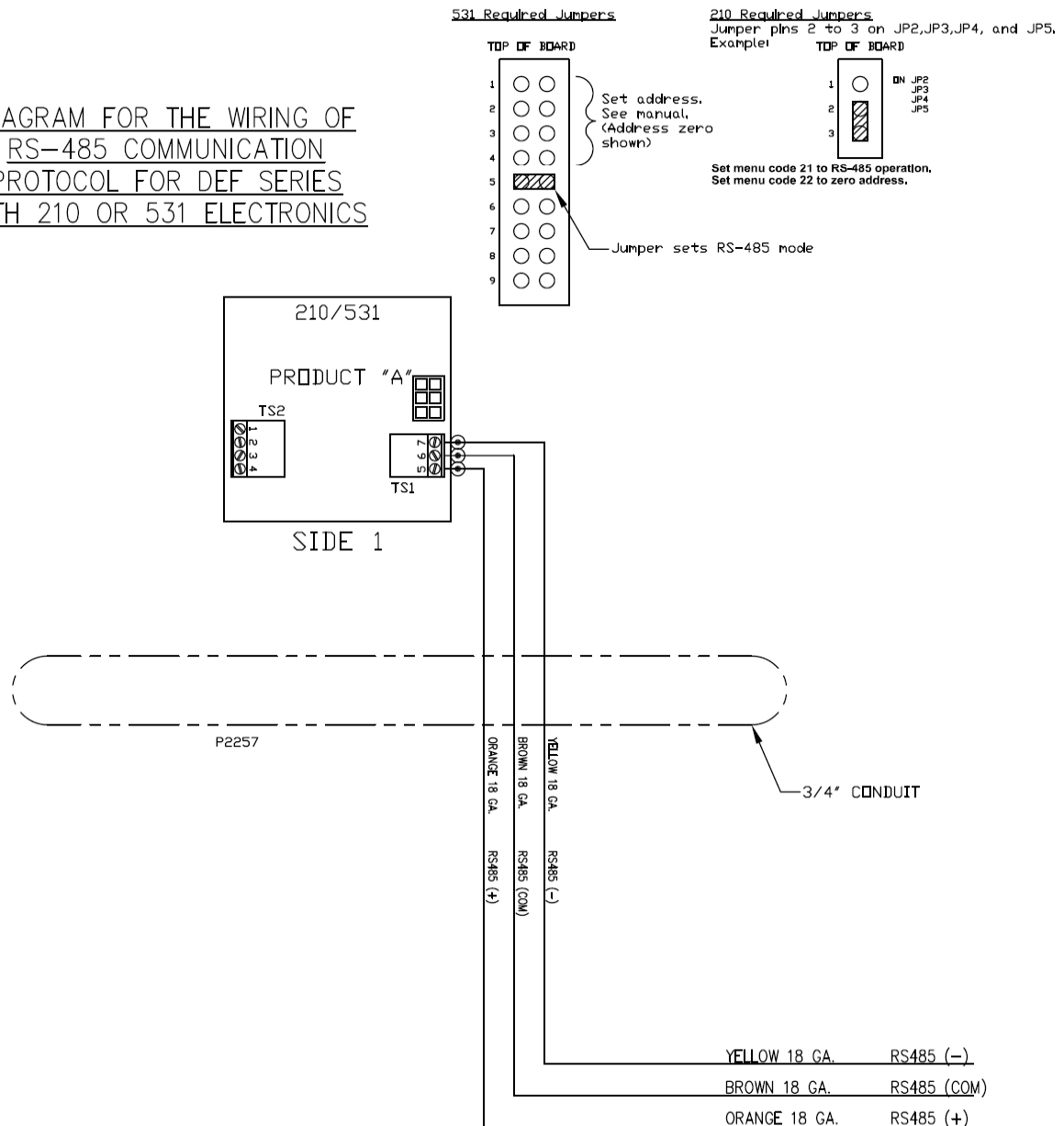
2. All wiring gauge is minimum required, stranded wire with THHN insulation must be used. Do not reuse old wire from an existing installation.

3. Do not use PVC conduit. Use only rigid metal conduit.

4. Field connection = ⊛

5. Set jumpers and menus as shown below and in the installation manual.

531 Required Jumpers

TOP OF BOARD

Set address. See manual. (Address zero shown)

Jumper sets RS-485 mode

210 Required Jumpers
Jumper pins 2 to 3 on JP2, JP3, JP4, and JP5.
Example:

TOP OF BOARD

ON JP2
JP3
JP4
JP5

Set menu code 21 to RS-485 operation.
Set menu code 22 to zero address.

DIAGRAM FOR THE WIRING OF RS-485 COMMUNICATION PROTOCOL FOR DEF SERIES WITH 210 OR 531 ELECTRONICS

210/531
PRODUCT "A"
TS2
TS1
SIDE 1

P2257

3/4" CONDUIT

ORANGE 18 GA.   RS485 (+)
BROWN 18 GA.   RS485 (COM)
YELLOW 18 GA.   RS485 (−)

YELLOW 18 GA.   RS485 (−)
BROWN 18 GA.   RS485 (COM)
ORANGE 18 GA.   RS485 (+)

Notes For Current Loop Communication Wiring Diagram

1. All wiring must be installed and used in accordance with the national electrical code (NFPA #70, Automotive and marine service code NFPA #30A), state and local electrical codes.

2. All wiring gauge is minimum required, stranded wire with THHN insulation must be used. Do not reuse old wire from an existing installation.

3. Do not use PVC conduit. Use only rigid metal conduit.

4. Remove factory wire for RS-485 by removing wire harness connected between J7 and TS1.

5. Absolutely no daisy chaining of data wires. Damage to the dispenser or console will result. Do not connect these wires if unit is used without a console.
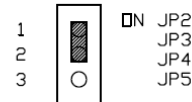
6. Field connection = ◉

WIRING CURRENT LOOP COMMUNICATIONS
PROTOCOL FOR DEF SERIES
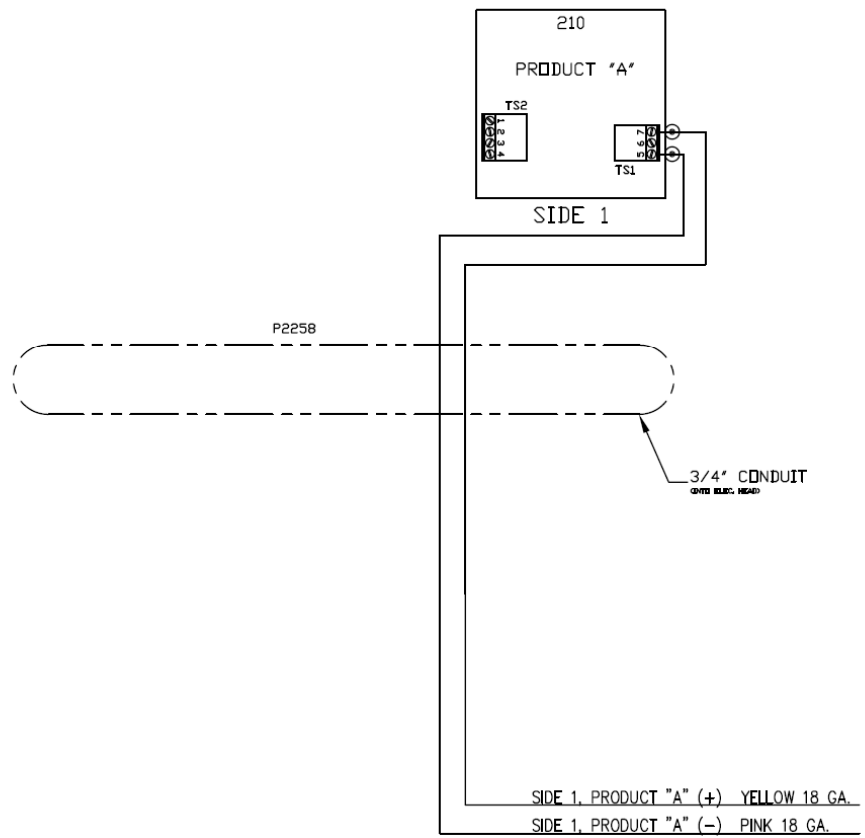WITH 210 ELECTRONICS
CURRENT LOOP COMMUNICATION

210 Required Jumpers
Jumper pins 1 to 2 on JP2,JP3,JP4, and JP5.
Example: TOP OF BOARD

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        ON  JP2
1           JP3
2           JP4
3   O       JP5
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Set menu code 21 to current loop operation.
Set menu code 22 to zero address.

210
PRODUCT "A"
TS2
TS1
SIDE 1

P2258

3/4" CONDUIT
ONTO ELEC. HEAD

SIDE 1, PRODUCT "A" (+) YELLOW 18 GA.
SIDE 1, PRODUCT "A" (−) PINK 18 GA.

BlueFueler Site Audit Form

Bennett Pump Company 1218 E. Pontaluna Road Spring Lake, MI 49456 **Audit Form 114089**	**Bennett Pump Company Site Audit Report This form must be filled out by a certified technician and mailed to Bennett to establish the equipment warranty.**	Date of Audit _____ Date of Installation _____

 Model of Dispensers and Serial Numbers

_____

_____

_____

_____

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_____

_____

_____

Site Information:
Site Phone Number_____
Site Name_____
Site Address_____
_____
City_____ State_____ Zip _____
Owned by _____
Equipment Purchase Date_____
Equipment Installation Date _____

Dispenser mode being used - Stand Alone _____   Console _____   Mechanical Interface _____
Type of Interface Box being used if dispensers are in Console Mode?_____
Third party interface system being used (Brand and Model)?_____

Yes	No	
☐	☐	If connected to a console, is the maximum distance between the dispensers and the Interface Box less than 500 feet?
☐	☐	Are the field wires in <u>metal</u> conduit only?
☐	☐	Does each dispenser have a dedicated conduit?
☐	☐	If located in a potentially cold region, is the dispenser installed in a heated facility?
☐	☐	Are the dispenser field wires Oil and Gas resistant, color coded, THHN, copper stranded?
☐	☐	Are the dispenser field wires continuous with no splices?
☐	☐	Is the resistance measurement between Ground and Neutral at the dispenser less than 1 ohm?
☐	☐	Are there no more than 2 dispensers on one breaker (maximum)?
☐	☐	Do the totes or tanks have product?
☐	☐	Are the dispensers on dedicated breakers and NOT sharing power with any other equipment (sub pumps, motors, air– conditioners etc.)?
☐	☐	If connected to a console, are the Interface boxes within 100 feet of the Point of Sale?
☐	☐	Is the dispenser mechanically mounted to concrete using securing bolts and shimmed for squareness?
☐	☐	Are all dispensers on the same phase of power?
☐	☐	Have the meter calibrations been verified?

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Audit Form (Cont'd)

Exceptions to Bennett Installation Instructions—(Is there anything out of the ordinary or worth mentioning that might affect safety or dispensing equipment operation?).

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Audited By:

Tech Name _____ Tech Email _____

Certification Number _____ Tech Phone _____

Company _____

Address _____ Tech Signature _____

Bennett Limited Warranty
for Products Installed in the United States

Bennett Pump Company guarantees new Service Station Equipment manufactured by Bennett against defects in material or workmanship during the warranty period in accordance with the provisions stated below:

- The Site Audit Report issued with all equipment must be completed and returned at time of installation to Bennett Pump Company, Spring Lake, MI to initiate warranty.
- Warranty service must be performed by the nearest Bennett Authorized Service Representative qualified to perform service on the defective equipment. Only Authorized and Certified Service Representatives are allowed to perform warranty service. Use of service personnel other than qualified Bennett Service Representatives without prior approval by Bennett Pump Company will void payment of any warranty claims.
- Labor and travel costs incurred while servicing Bennett equipment will be paid at previously contracted rates subject to published standard repair time allowances to qualified Bennett Service Representatives with travel cost limited to 200 miles. Travel cost shall be limited to 4 hours round trip.
- Bennett equipment has been installed according to the manufacturer's instructions and diagrams.
- During the warranty period, Bennett Pump Company will, at its option, repair or replace defective parts returned to its factory, transportation charges prepaid.
- The manufacturer reserves the right to make changes in the design or to make additions or improvements with respect to its products without incurring any obligation to modify or install same on previously manufactured products.

Pumps and Dispensers - Pacific & Horizon2 Series Dispensers

Warranty on parts, labor, and travel is 24 months from date of installation or 30 months from date of Bennett's original invoice, whichever comes first. An exception is any printer or printer driver board used in a pump or dispenser. For printers and driver boards: parts, labor, and mileage warranty coverage is for 12 months from the date of installation not to exceed 18 months from date of Bennett's original invoice.

This warranty excludes nozzles, hoses and fittings, hose retractor, filters, belt adjustments, paper jams, light bulbs, or any leaks after the installation start-up and audit. Minor adjustments such as meter calibration, pulser adjustments, and handle switch adjustments, customer specified items manufactured by others, and customer requested reprogramming of equipment are not covered by warranty.

BLUEFUELER 100 & 200 Series

Warranty on parts, labor, and travel is 90 days from date of installation followed by 9 additional months of parts only warranty or 18 months from date of Bennett's original invoice, whichever comes first. This warranty excludes nozzles, hoses and fittings, hose retractor, filters, belt adjustments, paper jams, light bulbs, or any leaks after the installation start-up and audit. Minor adjustments such as meter calibration, pulser adjustments, and handle switch adjustments, customer specified items manufactured by others, and customer requested reprogramming of equipment are not covered by warranty.

Pumps and Dispensers - All Other Models

Warranty on parts, labor, and travel is 12 months from date of installation or 18 months from date of Bennett's original invoice, whichever comes first.

This warranty excludes nozzles, hoses and fitting, hose retractor, filters, belt adjustments, paper jams or light bulbs. Minor adjustments such as meter calibration, pulser adjustments, and handle switch adjustments, customer specified items manufactured by others, and customer requested reprogramming of equipment are not covered by warranty.

Field Retrofitted Card Acceptor or Cash Acceptor

The field retrofit assembly is warranted for parts only for 12 months from date of installation or 18 months from date of original invoice, whichever comes first, except the receipt printer and driver board which is warranted for parts for ninety (90) days from the date of installation or 180 days from original invoice, whichever comes first.

Consumable Items such as receipt paper are not warranted. The use of receipt paper not specified by Bennett will void the printer assembly warranty.

Model 515 Pump Controller, 621 Module, Fan Out Boxes

Warranty on parts, labor and travel is 12 months from the date of installation or 18 months from date of original invoice, whichever comes first.

Software

Bennett Pump Company warrants Bennett products and software packages, whose operation is controlled by Bennett designed and developed software, shall be free of material defects and conform to current Bennett specifications for a period of ninety (90) days from the date of original invoice. Bennett shall use its best effort to correct such defects and to supply to purchaser at Bennett's expense, a corrected version within a reasonable time after purchaser notifies Bennett in writing of any defects and provides the programs and instructions required to reproduce the claimed defect.

This would not cover any modification to the program, the Bennett product, and/or connection to unapproved equipment made by any person or any defect caused by such modifications/connections.

Upgrade Kits

Bennett offers kits which are installed at the purchaser's option to enhance operating features of an existing Bennett product. These upgrade kits are warranted for parts only for ninety (90) days from date of installation or 12 months from date of original invoice, whichever comes first. This warranty applies to kit components only. The warranty status of the remainder of the product is unchanged.

Spare Parts

For equipment under warranty: The warranty period for all spare parts replaced is the remainder of the original warranty. Spare Parts are warranted for the value of the parts only (no labor, mileage, or other charges).

For equipment not under warranty: The warranty period is 90 days from the date of invoice to the end user, or 12 months from the date of original invoice, whichever comes first. Spare Parts are warranted for the value of the parts only (no labor, mileage, or other charges).

General Exclusions

1. Warranty does not apply to any product which has been altered, subjected to unusual physical or electrical stress, an Act of God, damaged by accident, tampered with, or subjected to misuse or abuse including substituting parts or accessories from other manufacturers without the written consent of Bennett Pump Company. The above warranties shall not exist if the original identification marks have been removed or altered.
2. Bennett is not liable for damage or necessary repairs caused by improper storage of DEF equipment in cold temperatures, or crystallization of product due to improper maintenance of DEF supply fluid.
3. Bennett makes no warranty with respect to the Bennett equipment or Bennett's performance of services under this agreement, express or implied, and Bennett hereby disclaims the implied warranties of merchantability and fitness for a particular purpose.
4. In no event shall Bennett be liable for any loss of profits, loss of use, interruption of business or indirect, special, incidental or consequential damages of any kind in connection with or arising out of the furnishing, performance, use or failure of the Bennett equipment, software or services acquired from Bennett, the distributor or the user, whether alleged as a breach of contract or tortuous conduct, including negligence. Bennett's liability hereunder for damages shall not, in any event, exceed the amounts paid by the buyer to Bennett for equipment, software or services as to which the claim arose.
5. No action arising out of any claimed breach of the Warranty Agreement or transaction under this Warranty Agreement may be brought by either party more than two (2) years after the cause of action has accrued.
6. Use of non-Bennett replacement parts, unless specified by Bennett, will void the equipment warranty.
7. This warranty only applies to Bennett equipment installed in the United States of America and Canada.
8. Failure to pay the Bennett invoice within stated invoice terms, covering the respective Bennett equipment purchased under this limited warranty may, at Bennett's discretion, void this limited product warranty.

BENNETT PUMP COMPANY
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