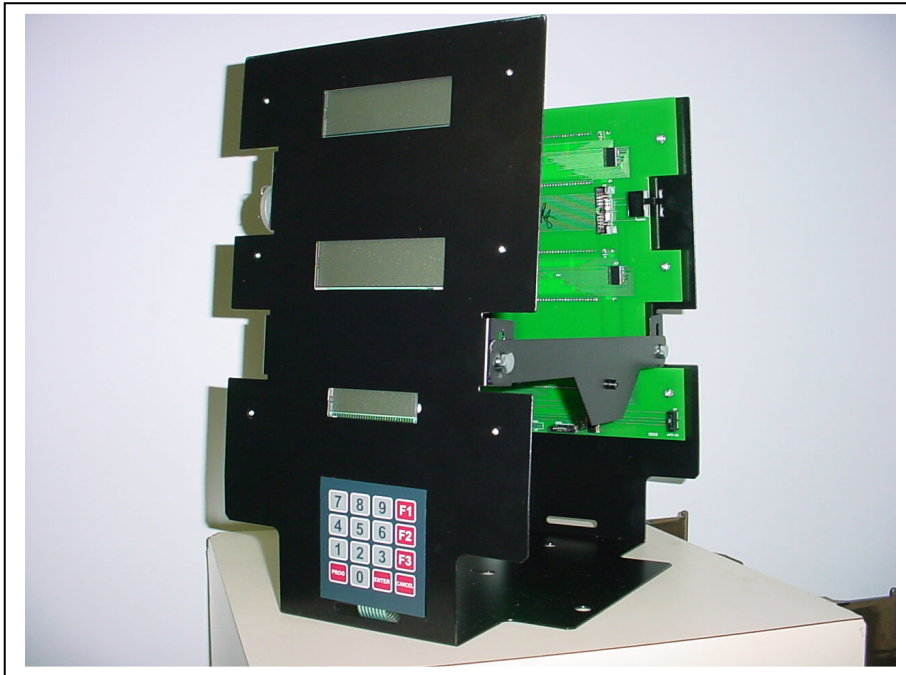


VVR-100 Veeder Root Electronic Replacement Head Installation Manual



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 you do not follow the instructions, you can cause damage to the equipment, injury, or death.

Triangle Microsystems Inc.
2716 Discovery Drive
Raleigh, N.C. 27604

Version: 09.22.2010

VRR-100 Replacement Computer

Table of Contents

1. Dangers, Warnings and Precautions
2. Introduction
3. Wiring Connections
4. Circuit Requirements
5. Earth Grounding The Equipment
6. RC Networks
7. Wiring For Bennett / Veeder-Root Reset Housings
8. Mechanical Dispenser Frame
9. Install The New Light Box Pan
10. Removal of the Veeder Root Mechanical Computer
11. VRR-100 Control Board Connections
12. Mounting the VRR-100 Display Housing
13. Installing Meter To Pulser Coupler
14. Final Pump Reassembly
15. Test Pump In Stand Alone Mode
16. VRR-100 Electronic Calibration
17. Programming the VRR-100

I. Dangers, Warnings and Precautions

FOR THE SAFE INSTALLATION, MAINTENANCE, AND OPERATION OF THE VVR-100 AND RELATED EQUIPMENT, READ AND UNDERSTAND ALL WARNINGS AND CAUTIONS.

"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" : Disconnect all power to this equipment and associated dispensers equipment during installation, service or any maintenance. Failure to do so can cause injury or damage equipment.

"WARNING": Maintenance and repairs must be done by QUALIFIED/TRAINED personnel.

"WARNING": To prevent electric shock, keep the electrical parts of the console dry.

"WARNING": You must have training in the installation and service of fuel dispensing equipment before working on this system.

"WARNING": Make sure this equipment is correctly grounded. Failure to do so can cause injury or damage equipment.

"CAUTION": Electronic components are static sensitive. Use proper static precautions (static straps) before working on the equipment.

"WARNING": Failure to properly ground all equipment can cause injury or damage equipment.

"WARNING": Installation must comply with National Code (NFPA #70), Automotive and Marine Service Code (NFPA #30A), Federal, State and local codes.

"CAUTION": Each dispenser must have a 12 gauge or larger green stranded ground wire connected from the grounding lug of the junction box to the main electrical service panel ground. (National Electrical Code, Article 514-7). It is unacceptable to rely on the conduit for this grounding requirement.

Important! Disconnect all power to dispenser, multiple disconnects may be required to de-energize this device for servicing.

II. Introduction



The mechanical pump has a long successful history with dispensing fuel for retail, commercial, marinas, etc . However, with the fast paced world of retail fueling sales, almost daily price changes, increasing fuel costs combined with the old image associated with the “spinning wheels” they have been largely replaced with very expensive modern day single and multi-product dispensers.. The VRR replacement head is an economical alternative to upgrading to a new single product pump or dispenser.

The VRR head was designed as a direct replacement for the mechanical computer known as the Veeder-Root register or computer. The VRR interfaces with most POS systems that recognize Gilbarco, Wayne, Tokheim, and Bennett electronic dispensers, and includes features including remote price changes, electronic calibration, and eliminates pulser limitations experienced with true mechanical type pumps and controllers.

The VRR replacement head can operate in two different modes: Stand Alone, or Console control.

Stand Alone Mode

Stand Alone mode allows the *VRR-100* to operate without being connected to a console or control device. This mode is programmed using the VRR keypad, described on page #

Console Mode

The VRR has been designed to look like a Gilbarco/Wayne dispenser. Any respective POS system that recognizes these dispensers should be compatible with the *VRR-100*. Console mode allows the *VRR-100* to communicate with compatible controllers. The *VRR-100* is shipped from the factory configured for the Stand Alone operation. Use the keypad at each fueling point to set the *VRR-100* to communicate in the console mode of operation. When using any console or POS, the respective interface box must also be utilized.

The VRR comes with the following items.

- (1) Main Display Frame that replaces the Veeder-Root mechanical computer.
- (1) CPU Main Control Board programmed for one of the following electronic pump protocols:

- Bennett
- Tokheim
- Gilbarco
- Wayne

Note: When ordering the pump frame and meter type must be specified. The meter ratio and communication style is preprogrammed in the factory

- (1) Pulser
- (2) Display Boards
- (1) Barrier Pipe Wiring Harness
- (1) Set of CPU Board Wire Connectors
- (1) (Meter/Pulser), Universal Connector Link Kit
- (2) Ribbon cable connectors
- (1) Attached keypad

And Misc. components

Tools suggested:

- Miscellaneous nut drivers, screwdrivers, wrenches and pliers typically required for pump service.
- Green leaf punches in both 1/2 and 3/4 inch sizes.
- Voltage and Ohmmeter, or voltage sensing devise.
- Wire crimp pliers butt splices, or wire nuts.
- Power drill and 1/2 inch drill bit.
- Measuring tape or devise.
- Metal cutting saw.
- 1/2" tap and dye set

III. Wiring Connections

VRR-100 Wire Color	Wire Description	Notes
BLACK _____	CPU AC HOT	Can also be used as the AC Hot for fast and slow valves.
WHITE _____	CPU AC NEUTRAL	
GREEN _____	CPU EARTH GROUND	
RED _____	MOTOR FEED INPUT	Separate circuit from CPU AC HOT
RED _____	MOTOR FEED OUTPUT	Separate circuit from CPU AC NEUTRAL
BLUE _____	HANDLE (1)	To one side of handle switch
BLUE _____	HANDLE (2)	To one side of handle switch
VIOLET _____	FAST VALVE NEUTRAL	Determine fast and slow valves by connecting the yellow to only one valve. If it pumps in slow flow, connect the violet to the other valve. If it pumps fast, disconnect the yellow, and connect the violet to this valve, then connect the yellow to the remaining valve.
YELLOW _____	SLOW VALVE NEUTRAL	
ORANGE _____	DATA (+)	TOKHEIM PROTOCOL ONLY
BROWN _____	DATA (-)	
GREY _____	DC COMMON	
BLACK (taped WHITE together)	LIGHT AC HOT	Separate circuit from CPU and MOTOR HOT
	LIGHT AC NEUTRAL	Separate circuit from CPU and MOTOR NEUTRAL

IV. Circuit Requirements

Ideally, each pump frame would receive a shielded and twisted data pair at 18awg., an Earth Ground, and 3 separate AC Hot and Neutral circuits from the building.

1. CPU Power
2. Light Power
3. Pump motor Power (AC Hot and Neutral, or L-1 and L-2 for 220VAC operation)

That totals 9 wires per single or dual or single product frame. It's recommended to have 3 separate hot and neutral circuits and an earth ground run to each pump junction box. Not all locations will have this ability. If need be, share the pump lights and pump motor AC Hot. When the store is closed, the pump motor and the lights will not be powered, but the VRR-100 displays will continue to be powered and glow blue.

Determine wiring details and pump configuration before disassembly. Map-out wires, find available circuits, and check pump for proper operation and calibration. The pump/meter must be accurate to within 9 cubic inches before the VRR-100 electronic calibration can be completed. Doing these pre-checks now will save time and trouble-shooting time later on.

V. Earth Grounding The Equipment

WARNING: Failure to properly ground the equipment can cause injury or damage to the equipment.

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

1. Connect a 12-gauge, green stranded wire to the grounding screw near the terminal block in the junction box.
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 conduit as a ground.

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

3. Do not daisy-chain ground wires. All ground wires must be kept separate.

VI. RC Networks

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. The submerged pump motors are controlled by an auxiliary pump motor relay. Follow this procedure to protect dispenser and console operation:

1. Use an RC Network on the coil circuit and across the contacts of each submerged pump motor control relay. See wiring diagram.
2. Check local code requirements concerning complete disconnect of submerged pump voltages. RC Networks will allow voltage to be present at all times.
3. Turn off all related circuit breakers when servicing submerged pumps or dispensers.

VII. Wiring For Bennett / Veeder-Root Reset Housings

This document pertains to Bennett mechanical pump frames being converted to communicate with a Gilbarco, Tokheim, or Wayne electronic compatible controller. Any frame being converted for use with a card-lock or traditional mechanical pump controller should consult a manual specifically written for that specific application.

Wiring situations in pumps and at locations can vary widely. Exercise caution and investigate thoroughly, and establish a sound wiring scheme before beginning pump teardown,

Factory Colors J-Box to Reset	New VRR-100 Description	VRR-100 Wire Colors
Gray	Light Neut.	White w/tape
N/A	Light AC Hot	Black w/tape
Orange	Spare	
Orange	Data [+]	Orange
Brown	Data [-]	Brown
Pink	Spare	
Black	Mtr. Feed and Valve AC Hot Blue	Red
Black	Motor Return AC Hot	Red
Blue	Spare	
Black	CPU AC Hot	Black
White	CPU AC Neut	White
N/A	Reset Chassis Ground	Green
Pink	Spare	
Yellow	Slow Valve Neut. White	Yellow
Violet	Fast Valve Neut. White	Violet
N/A	Handle N.O.	Blue
N/A	Handle N.C.	Blue

VIII. Mechanical Dispenser Frame

Mechanical Dispenser Frame BENNETT.

- Check pump for proper operation and calibration. The pump/meter must be accurate to within 9 cubic inches before the VRR-100 electronic calibration can be completed.
- Determine wiring details and pump configuration before disassembly. Map-out wires, find available circuits. Doing these pre-checks now will save time and trouble-shooting time later on.
- Open and remove the upper and lower cabinet doors from each side of the pump. **It is important that the inside of the pump be completely exposed to outside air to allow any accumulated vapors to escape.**
- Open lower pump junction box and use a VOM or voltage checker to confirm all electrical power has been turned off to this unit.

Important! Disconnect all power to dispenser, multiple disconnects may be required to de-energize this device for servicing.

- Remove pump top cover by removing **and saving** the 4 screws located on each corner.
- Remove and properly discard the fluorescence lamps from upper electrical enclosure (light box).
- Remove the lid to the top electrical enclosure exposing the light ballast and various electrical connections. **Save this cover for later use.**
- Remove wire nuts from ballast power supply wires.
- Drill-out the conduit supplying the AC Hot and AC Neutral from the reset housing to the light box electrical enclosure.
- Remove and save all conduit nuts and the 4 bolts located in each of the corners.
- Remove the upper electrical enclosure from the pump frame.

Top Pan Cover



IX. Install The New Light Box Pan

- If updating a single fueling position, align the new pan with the CPU board on the same end of the pump frame associated with the handle switch.
- Measure and make any new holes required to accept the existing conduits associated with the particular pump being retrofitted. The old light box can be used as a template.
- Re use original light box mounting hardware to install the new light box, keeping all hardware loose until pump operation is confirmed.

X. Removal of the Veeder Root Mechanical Computer

- Remove the Veeder-Root Mechanical computer's mounting bolts from the mounting plate and electric reset housing.
- Detach the Bennett reset motor assembly from the side of the Veeder-Root head and any wires that are attached to the pulser.
- Remove the mechanical computer from the pump by guiding past any conduits.
- Remove the handle switch side of the pump frame. **If this is a dual hose pump, remove and re-assemble one side at a time to make the total installation process easier.**



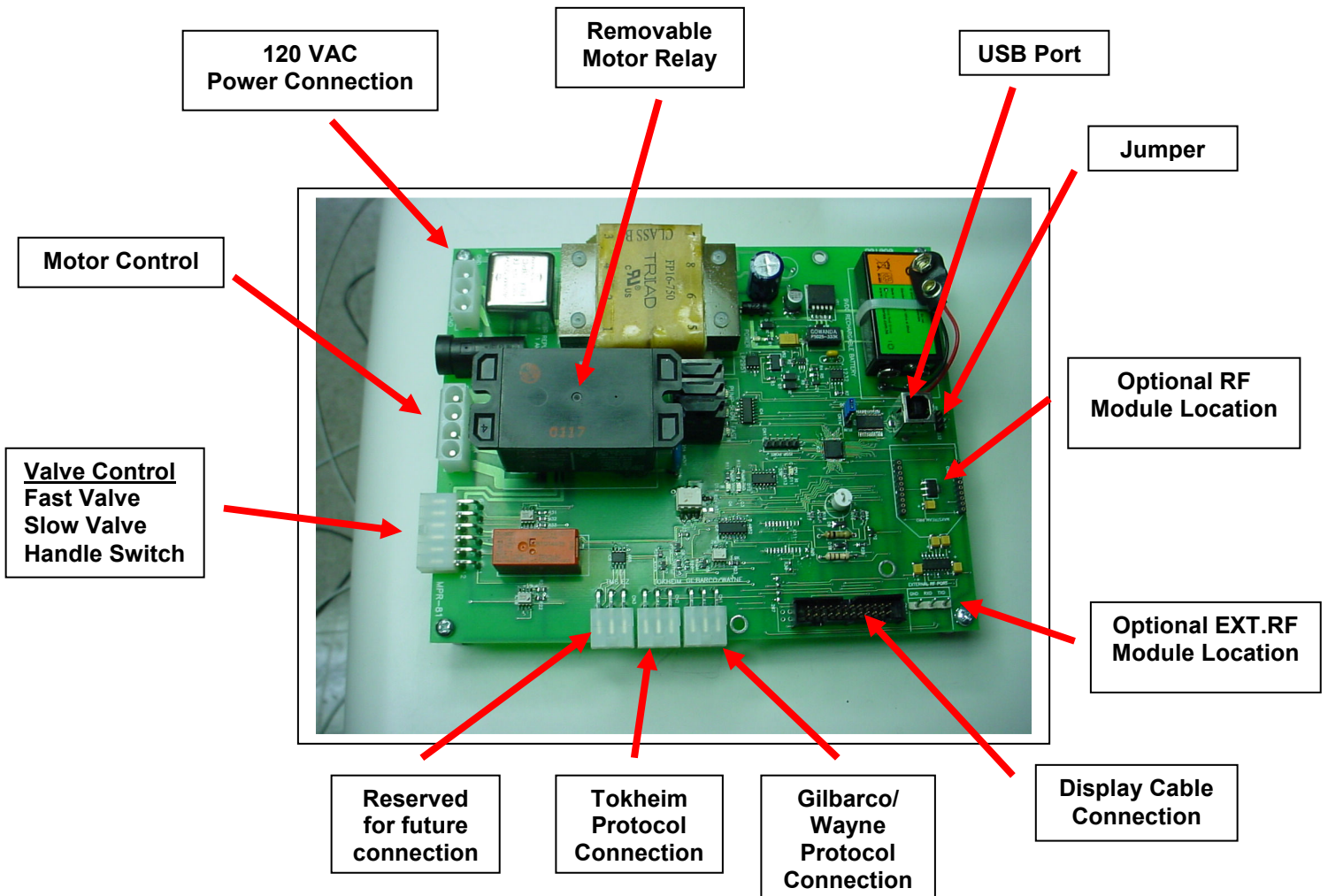
- **Save the small shaft connecting the reset motor to the outer handle switch.**
- Remove the reset housing cover, exposing all of the switches and gears.
- Keeping cam, "scissor" mechanism, and the handle switch in place, remove the motor switches, reset motor,
- This is how the reset housing should look after removing all of the components you will not need.

(need picture.....)

- Feed the VRR-CPU-CONN wiring harness from above the light box, through the conduit previously drilled out, and into the reset housing.

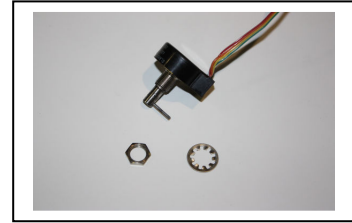
Rotate both the top and bottom sections of the wiring harness until the sealed coupler is tightened securely to the conduit. Determine, and adjust if needed, the clearance between the harness and the light box lid.

XI. VRR-100 Control Board Connections



XII. Mounting the VRR-100 Display Housing

- Before mounting the housing install the optical encoder (pulsar) in the base of the housing. The optical encoder comes with the roll pin partially inserted in the shaft. This allows the lock ring and the lock nut to be attached to the encoder once it is inserted into the display housing.

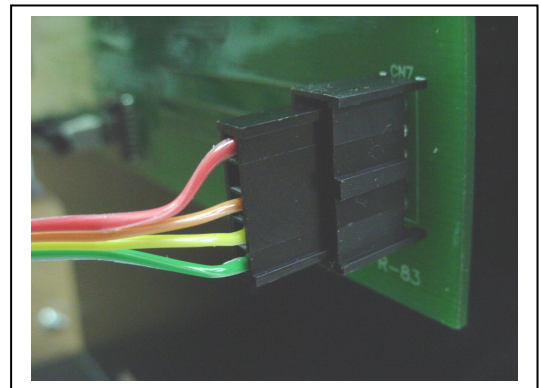


Note: there is a little tab on the underside of the encoder. Make sure that the tab fits into the slot on the bottom of the display frame before locking in place.

- The encoder is shown inserted into the base of the display housing. The pulser should be mounted with the roll pin washer and nut on the under or outside of the display frame. The pulser will be mated up to the meter with a supplied coupler discussed later in this document. Once inserted and secured, the roll pin can be pushed further into the shaft.



- Once the optical encoder has been positioned and locked in the display frame, attach the encoder cable **to the Non-calibration display board**, opposite the calibration board in the U-frame. The calibration board is equipped with a calibration switch, and is connected to the unit's keypad.

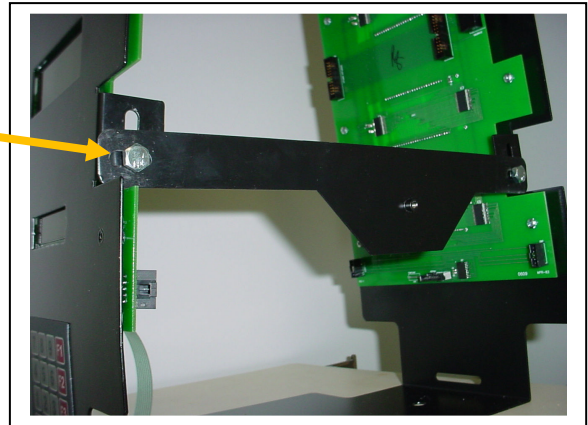


- The hole pattern on the base of the housing matches the three hole, Veeder-Root mounting hole pattern. Carefully position the housing over the holes and attach using $\frac{3}{4}$ " long, #10-32, bolts. **DO NOT TIGHTEN** bolts until the stem assembly has been attached between the Optical encoder and the meter.
- The VRR display frame shown being placed into a Bennett mechanical pump frame.



- DO NOT TIGHTEN THE SCREWS, after the VRR head has been inserted in the pump frame. Tighten hardware only after the pump assembly has been determined to be fully operational.

On Bennett pump frames, leave this screw out until the display frame is mounted.



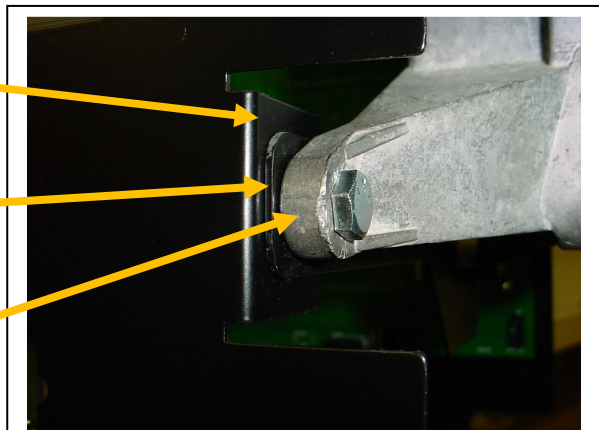
Note: The threaded standoff points outward, away from the frame. Remember to leave the screws loose until the frame is positioned on the pump frame.

- Then pass the screw through the leg of the Bennett reset motor housing, and through both the support bracket and the display frame.

Display Frame Support Tab

Support Bracket

Bennett Reset Motor Housing



- Pass the ribbon cable through the top pan and the barrier pipe, then slide the barrier lock ring over the connector on to the barrier pipe and secure it in place.
- Attach the ribbon cables to the display boards. NOTE: IT DOESN'T MATTER WHICH OF THE 4 BOARD CONNECTORS ARE USED. All connectors are wired the same, and polarity is maintained using "keys" on the ribbon cable and associated boards.

XIII. Installing Meter To Pulsar Coupler

- Measure the distance between the bottom of the encoder (pulsar) shaft and the top of the meter using a tape measure.
- Making sure to measure from the end of the rod containing the pre-assembled dowel pin, mark off the distance on the stem assembly (aluminum rod) and cut accordingly.
- Slide the collar onto the stem assembly with the open end on the collar pointing away from the dowel pin on the stem assembly.



- Drop the end of the stem assembly with the dowel pin into the meter collar.
- Slide the aluminum collar over the optical encoder shaft and dowel pin, making sure to align the encoder dowel pin into the open slot of the collar..
- When in place lock both #4-40, allen head set screws with supplied allen wrench.
- The stem assembly between the encoder and meter should be as vertical as possible. Arrange the display frame accordingly to achieve the best vertical situation.
- Tighten the display frame to the pump chassis.

IXV. Final Pump Reassembly

- Recheck wiring, then replace reset housing cover, and replace nozzle side of pump frame, being sure to include handle switch pin saved earlier between the outside handle assembly and the reset handle switch input.
- Confirm smooth handle switch pin/shaft operation. Adjust pump side frame, display frame, display frame supports, and conduits as needed. Recheck meter to pulsar coupler, and tighten all screws, nuts, and bolts.
- Apply power to the dispenser, and confirm pump operation.

XV. Test Pump In Stand Alone Mode

As with any and all other pumps, purging the lines, and checking pump operation is paramount before going through the calibration process.

Let pump motor run and fill your test can as needed to ensure the pump is ready for calibration.

XVI. VRR-100 Electronic Calibration

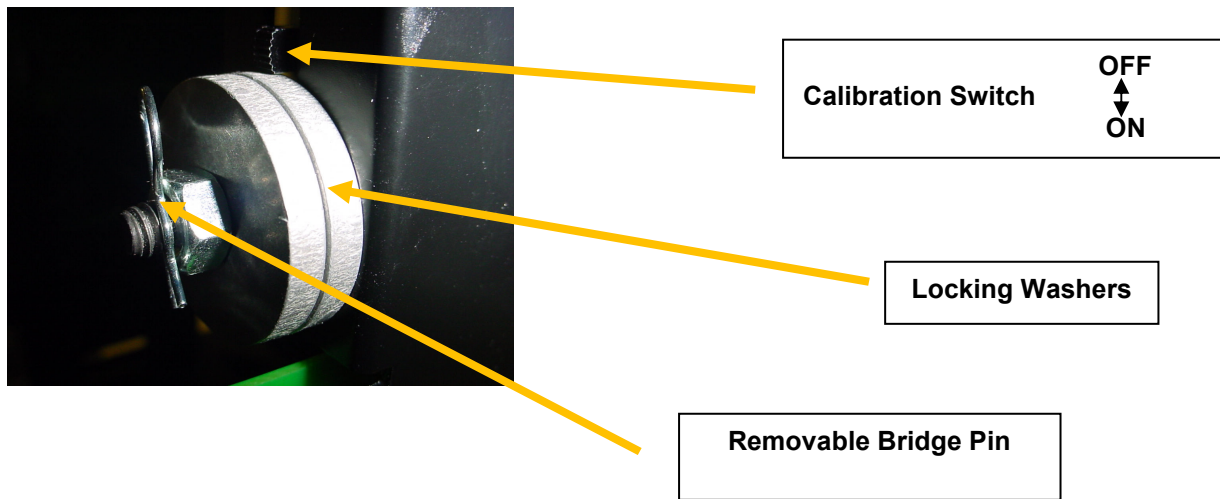
The calibration procedure for the VRR is straight forward and uncomplicated. The calibration switch is located on the left side of the display bracket.

The calibration switch is on one side only and is located here



The illustration below shows a close up of the calibration switch and calibration security washer assembly, which includes two (2) security washers, ¼ nut, and removable bridge pin. The VRR electronic head comes with the bridge pin in place. However, after calibration is complete, the bridge pin should be discarded and a standard multi stranded steel wire should be threaded through the hole two (2) times and then sealed with a metal crimp to prevent tampering.

After calibration the locking washers will hold the calibration switch in the OFF position and prevent the calibration switch from moving down into the ON position.



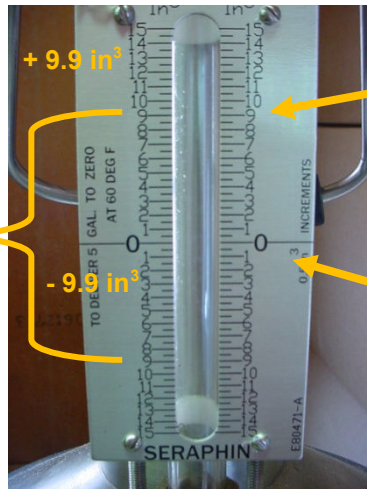
Note: If the dispenser has not been run for some time, operate the dispenser for a few cycles through the calibration can to wet the can and pressurize the system.

The pump should be calibrated in Stand Alone mode.

- Remove the bridge pin, 1/4:"nut, and security washers from the side of the VRR and move the calibration switch to the down position (turn "ON"). When in the full down position the screen will display the following.
- The dispenser is ready to be calibrated.
- During calibration with the calibration switch turned on, ignore all gallon readings on the VRR-100 display. Your attention should be on the calibration can, and the fluid in the sight tube.



- Lift the handle and confirm the volume display window reads zero, then fill the can up to +/- 1 to 3 cubic inches over or under 5 gallons.
- Hang up the nozzle and press enter on the keypad.



The acceptable fill range for the VRR is +3.0 c" and -3.0 c".

Note: The scale on the calibration sight tube shown has + 15.0 c" and -15.0 c" increment range.

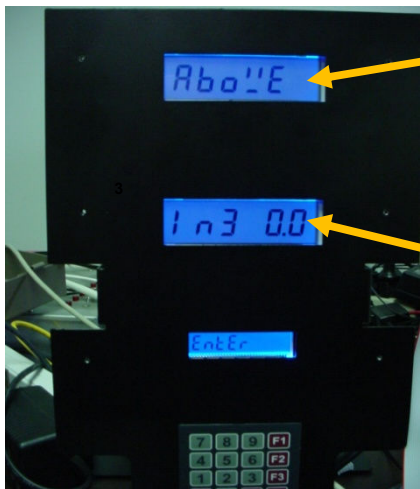
3 Filling Technique
The meter must be accurate to + or - 9.0 c" prior to starting. The calibration can should be filled and stopped close to 0 c".

- When the 5 gallon calibration can sight tube has a volume reading +/- 3 cubic in, turn the handle switch to the OFF position, and press the ENTER button on the VRR-KEYPAD.
- The screen will show "ABOVE" and "BELOW" on the displays. Press either F1 or F2 on the VRR-KEYPAD, depending on whether the meniscus in the measuring can sight tube is above or below the "0" position. Press the "F1" for above, or "F2" if the meniscus is below the zero mark of the sight tube.



Press the "F1 or F2" button
 "F1" for "ABOVE"
 "F2" for "BELOW"

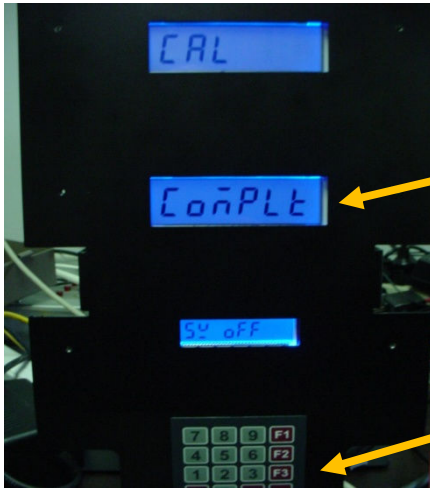
- Depending on which button ("F1" or "F2") is pressed the top screen will display either Above or Below. In the middle screen, enter the number of cubic inches on the VRR-KEYPAD, and press enter. The decimal point is fixed.
- **Note: Continue pressing number buttons until the correct reading is displayed in the middle screen. If you press ENTER with the incorrect number showing in the middle screen, the calibration calculations will be incorrect, and the unit may give a calibration error. If you receive an error, or enter the wrong reading, the entire process will have to be repeated.**



In the example shown, the display shows "ABOVE" because the calibration number was above the "0" mark, and the "F1" button was pressed.

Example: If the volume in the sight tube is "ABOVE" by 2.5 in., press 2 then 5, and press ENTER. The decimal is fixed.

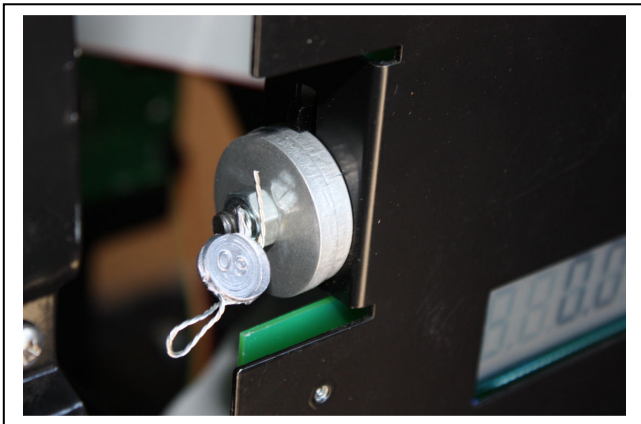
- Press enter and the display will show the following screen. This screen indicates that the calibration factor has been successfully entered into the VRR.



Complete

Press the “CANCEL” button twice to return the display to standard operation.

- When the calibration is completed return the calibration switch to the up position which turns the calibration mode OFF. Reposition both security washers and the 1/4:”nut on the threaded screw. Insert the calibration wire through the hole in the screw. Crimp the wire lock on the calibration wires.
- Properly positioned, the combination of security washers, 1/4:”nut, and the calibration wire will prevent the calibration switch from being moved into the ON position.



XVII. Programming the VRR-100

1. Press the PROGRAM button.
2. Press the F1 button for program mode, and to progress through the programming functions.
3. Enter the password 2716 and press ENTER.
4. **Address.** Enter the fueling point ID number, then press enter.
5. **Stand Alone.** Enter 1 for Console mode, or 0 (zero) for Stand Alone.
6. **Price.** Enter a PPU if this position will operate in Stand Alone or is being controlled by a “Mechanical” pump controller (Pulse Output operation).
7. **No Valve.** Enter 1 if there is no Slow Valve present, or 0 (zero) if equipped with 2 valves.
8. Press CANCEL twice to exit programming mode.