VL9-S 14-DIGIT
RESETTABLE / PROGRAMMABLE
TOTALIZER / REMOTE READER FOR
SWITCH/PULSE OUTPUT METERS

Installation and Operation, Firmware Version 3.00 and Later

PRODUCT OVERVIEW

The VL9-S remotely counts switch closures or pulses from a remote meter register, allowing meter readings to be quickly displayed in a more convenient or accessible location. It is was designed primarily for use with water meters, but may be used with any meter which generates pulses by shorting two wires together using a mechanical switch (such as a reed switch) or an electronic device such as an open-drain transistor. The pulses are counted by the VL9-S, and the running total is available for display at any time. The VL9 display is activated to display the current reading by striking the gold disc on the front, making an acoustic vibration. A fingernail, coin, key, or any hard object may be used which can create a distinct tap. The VL9-S can display both letters and numbers, including decimal points, which allows informational messages to be displayed as well as meter readings. The number of meter reading digits and the current reading may be programmed to match the remote meter, so that the VL9 and the changing digits of the remote meter roll over at the same time (from 9999... to 0000...), allowing the VL9-S and the remote meter to be compared for accuracy at any time, even after roll-over. Up to 14-digit meter readings may be accommodated over distances up to at least 2000 feet. The VL9-S may also be used without programming, defaulting to 6 meter reading digits with no decimal point, starting at the value 000000.

WIRING

The VL9-S has 2 wires. Polarity may be important for meters with an output consisting of an electronic switch closure, such as an open-drain or open-collector transistor which is switched on and off. In this case:

RED should be connected to the positive output of the meter, usually either red or green (green for Hersey 430 or Zenner, red for Badger RTR).

BLACK should be connected to the negative or ground output of the meter, usually black wire.

For meters with a mechanical switch closure there is no polarity, so the red and black wires may be connected to either of the two terminals or wires on the meter.

If the cable has a shield or additional unused wires, they should remain unconnected at both ends. The use of shielded cable is not recommended, but if used, the shield may be connected to earth ground but not to either wire of the meter or the VL9.

NOISE REJECTION, SWITCH BOUNCE REJECTION

Only pulses which meet the pulse specifications stated below are accepted as valid to increment the reading. Pulses which do not meet those specifications are rejected as noise or switch bounce.

ERROR DETECTION

Upon receipt of a valid pulse from the remote meter, the VL9-S performs a memory integrity test to detect any errors in the previously stored meter reading. If a memory error is detected, the error message "ERROR DETECTED" is displayed prior to display of each future meter reading. This message can only be cleared by going through the reset procedure in the separate document *VL9-S Reset and Programming*. Memory errors should never occur under normal circumstances, but are possible under extreme conditions such as a nearby lightning strike. The full reset is required to reinitialize all random access memory.
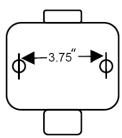
PHYSICAL INSTALLATION

Suggested Tools:

- Electric drill
- 3/16" carbide masonry drill
- Screwdriver
- Wire stripper
- Wire cutters
- Terminal crimp tool
- Scotchlok crimp tool

Materials Required:

- Masonry fasteners
- Caulking compound

The Visu-Link electronics and battery are environmentally sealed and suitable for outdoor installation when using the Scotchlok wire connectors (**IP67 certified**).

1. Remove VL9 cover.
2. Using the VL9 base as a template, locate and mark mounting holes on outside wall of building. For best results the VL9 should be located at eye level in an easily accessible location.
3. Secure VL9 base to wall by drilling locating holes as shown in the drawing below. Use caution when drilling holes in walls, there may be wiring inside. Wear safety glasses. Comply with all necessary ordinances and codes.

4. Run the cable from the meter to the VL9. Never place the cable in a conduit with conductors carrying AC line voltage.
5. Attach cable to meter and to VL9 following the WIRING instructions above.

PROGRAMMING

Programming is optional. The VL9-S comes from the factory with the number of digits preset to 6 with no decimal point, the reading preset to 000000, and incrementing the count by 1 for each pulse received. It may be used this way if it is not necessary to program it to match the meter reading shown on the meter. There is also a password-protected reset function which can reset the VL9-S to this state. Refer to *VL9-S Reset and Programming* instructions to perform this reset or to enter the programming mode if programming is desired.

Even if the default unprogrammed mode of operation is desired, a test should still be run to determine how many pulses the meter puts out per increment of the right-most (least-significant) moving odometer digit. Enough water should be run through the meter to cause that right-most digit of the meter to advance by 1. If the count on the VL9-S has also advanced by 1, then programming is optional. However, if the VL9-S advances by more than 1 count when the meter advances by 1 count, then the VL9-S will count may advance faster than the meter odometer digits if it is not programmed, so programming should be performed.

A major advantage of programming is that the number of digits and meter reading on the VL9-S may be initialized to match those on the face of the meter. The input divider may also be programmed to divide the number of input pulses by 2 for meters which put out 2 pulses per increment of their odometer digits. Choosing the same number of VL9-S digits as meter digits will cause the VL9-S and the meter to roll over from 9999... to 0000... at the same time and stay in sync. By matching both the reading and the number of digits, as well as selecting the proper input divider, the reading displayed on the VL9-S should match the reading shown on the face of the meter at all times.

Before programming, the number of pulses per increment of the meter reading must be determined. Start with a VL9-S programmed to its default of 1 pulse per count. The reading and decimal point location do not matter for this test.

With the VL9-S installed and wired as stated above:

1. Write down the current meter reading and the position of the sweep hand (if it has one).

2. Tap the gold disc on the front of the VL9-S to display the VL9-S reading and write it down.

3. Run enough water through the meter to advance the main sweep hand (if it has one) all the way around to the same position (1 complete revolution). If the meter has no sweep hand, run enough water to increase the displayed reading on the meter by 1.

4. Tap the VL9-S again and write down its displayed reading. If it is the same as in step 2, run a little more water through the meter to be sure it has advanced a full 360° or one full digit, until the VL9-S displays a number at least 1 higher than in step 2.

5. Subtract the current VL9-S reading from that obtained in step 2, then look up this value in the left column of the table below to determine programming values for "Number of Digits", "Decimal Point Location", and "DIVIDE Value":

Step 5 Result		Recommended Programming Values			
		Number of Digits	Decimal Point Location	DIVIDE Value	Example Meter Type
1		Same as meter	Optional	1	NITRO II, PMPD, PMN
2		Same as meter	Optional	2	Hersey 430
10		1 more than meter	1 digit to the left of far right digit	1	Badger RTR (Recordall Transmitter Register)

"Same as meter" in the above table means the number of VL9-S digits to be programmed is the same as the number of moving odometer wheels or changing digits on the face of the meter, not including any painted on or fixed zero at far right and not including the sweep hand pointer (if it has a sweep hand).

For most meters the "Step 5 Result" will be 1, so the programming values will be those of the first line in the table above. In this case the meter puts out 1 pulse per increment of the meter reading on its face.

Some meters put out 2 pulses per increment of their displayed reading. This would be the second line in the table above, in which the "DIVIDE Value" would be 2 to divide the number of meter pulses by 2 (ignore every other pulse).

For most meters, the decimal point location may be where ever desired. If set to the far right while programming, it will not show up during readings. If programmed to any other position it could be used to match the location of a decimal point on the face of the meter, or to mark the digits used for billing readings.

The last line in the above table is for the Badger RTR and similar meters which put out 10 pulses per revolution of the primary sweep hand. The number of digits to program into the VL9-S will be 1 more than the number of changing odometer digits on the meter. Since the RTR normally has 6 moving odometer digits (not counting a 7th digit at far right which does not move since it is a painted-on zero), the table indicates that 6 + 1 = 7 digits should be programmed into the VL9-S for "Number of Digits". The decimal point should be located to the left of the right-most digit. The first 6 digits of the meter reading should be programmed to match the 6 odometer digits of the Badger RTR, and the 7th digit should be programmed to match the number pointed to by the sweep hand (or just below that number if it is between digits). The meter reading displayed by the VL9-S to the left of the decimal point matches the moving odometer digits on the face of the meter, and the digit to the right of the decimal point matches the number pointed to by the sweep hand. The number to the right of the decimal point (representing the sweep pointer position) will normally be ignored when reporting the billing reading.

EXAMPLE FOR BADGER RTR:

Suppose the meter has 6 moving odometer digits which show: 1 2 3 4 5 6
Sweep hand is pointing between 7 and 8 (or between 0.7 and 0.8 depending on units)

Program into VL9-S:
Number of digits = 7
Meter reading: 1234567
Decimal point location: 1 digit in from far right
DIVIDE value: 1
Resulting VL9-S reading displayed after programming: 123456.7
Billing reading could be: 123456

EXAMPLE FOR NITRO II:

Suppose the meter has 6 moving odometer digits which show: 1 2 3 4 5 6
and a painted on "0" at the far right which does not count (since it is not a moving digit).
Don't care where sweep hand is pointing.

Program into the VL9-S:
Number of digits = 6
Meter reading to program into VL9-S: 123456
Decimal point location: far right (will not show up after programming)
DIVIDE value: 1
Resulting meter reading displayed after programming: 123456
Billing reading could be: 123456

OPERATION

Tap the gold dot to display the meter reading. If there are more than 8 digits, the upper digits will be displayed first, then the lower 8 digits. The display updates real-time if a meter pulse comes in while the display is active. The reading is followed by a display of battery voltage, then the firmware version number. If the VL9-S is tapped during display of the battery voltage or firmware version, the meter reading is immediately re-displayed.

TECHNICAL SPECIFICATIONS

- ❖ **CONSTRUCTION**: Size: 4.6" X 4.3" X 2" thick (11.7cm X 10.9cm X 5.1cm thick) Weight: 9oz (254g). Environmentally sealed to keep unit waterproof and to ensure no internal fogging. Operating temperature: -4 to 140 °F (-20 to 60 °C)
- ❖ **WIRING:** Recommended cable has 2 conductors of 22 to 24 gauge solid wire, preferably without shielding. If a 3-conductor cable is used, the third wire should not be connected. If shielded cable is used, the shield should not be connected to either of the signal wires, although the shield could be connected to earth ground. The VL9-S should function over a cable distance of at least 2000 ft.
- ❖ **NUMBER OF DIGITS:** Optionally programmable from 4 through 14, or just use the default of 6.
- ❖ **METER READING:** Programmable to any value, or may be reset to zero (which is the default).
- ❖ **DECIMAL POINT:** A decimal point may be placed after any of the lower 8 digits which are in use. If programmed to the right-most position, no decimal point will be shown (which is the default).
- ❖ **PULSES PER COUNT (INPUT DIVIDER):** The VL9-S may be programmed to count every pulse (divide by 1 which is 1 pulse per count, default) or every other pulse (divide by 2 which is 2 pulses per count).
- ❖ **PULSE SPECIFICATIONS:** Each meter switch or pulse output must be CLOSED or ON (pulling down a resistor connected on the other end to just under 4 V) for a minimum of 30 milliseconds, followed by an OPEN or OFF period of at least 300 milliseconds. Closed current is less than 1 milliamp.
- ❖ **POWER SOURCE:** The VL9-S has an internal non-replaceable 3.6 volt lithium battery. It has a calculated life of 10 years.

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04/11/2024 Rev 2

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