Integrated Control Systems

# PULSE ANALYZER
# INSTRUCTION MANUAL

## I. Overview

The PA1 pulse analyzer was designed to assist the service technician in troubleshooting pulser problems with consoles or card systems. The PA1 performs 3 basic functions:

1. Reads and displays pulses directly from a contact closure type pulser, electronic open-collector pulser, or active pulser.

2. Reads and displays pulses in-circuit from a pulser connected to a console or card system.

3. Emulates the operation of a pulser by generating a contact closure pulse output.

## II. Background

A pulser is a device which usually mounts to the register of a fuel pump or dispenser, and generates an output signal which is proportional to either the value or quantity of fuel being dispensed in real time. These signals are input to a console or card system where they are interpreted, allowing the console or card system to record the fuel flow.

Pulsers fall into two general categories; Active and Passive.

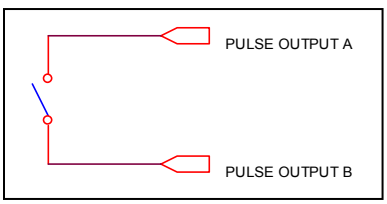
Active pulsers are powered by an input voltage, usually 12 volts DC. They will generate a specific output voltage pulse which is then input to a console or card system. Active pulsers are usually manufacturer specific, which means they only work with the same manufacturer's equipment.

Passive pulsers may require an input voltage to supply their internal circuitry, just as active pulsers do. A passive pulser however, does not generate a voltage output, but simply switches two contacts together to generate the output pulse. This is known as a contact closure output. It behaves like a simple switch contact. This technique is more compatible with different manufacturer's equipment, because it will work with many different voltages.

Some common examples of contact closure output pulsers are: V/R 1871, (Western Electronics / Emco Electronics / OPW) models 400B and 500, Integrated Control Systems models SP1, FR1, GB1, and VR1.

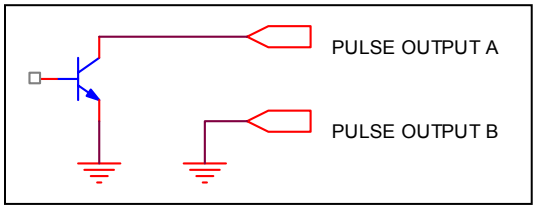
It should be noted that the V/R 1871 pulser uses a mechanical reed switch, while the others listed above utilize an electronic solid state relay for the pulse output. The solid state relay is much more accurate than a mechanical switch, as a mechanical switch will bounce, producing unwanted extra pulses.

Below is a schematic representation of a contact closure output:



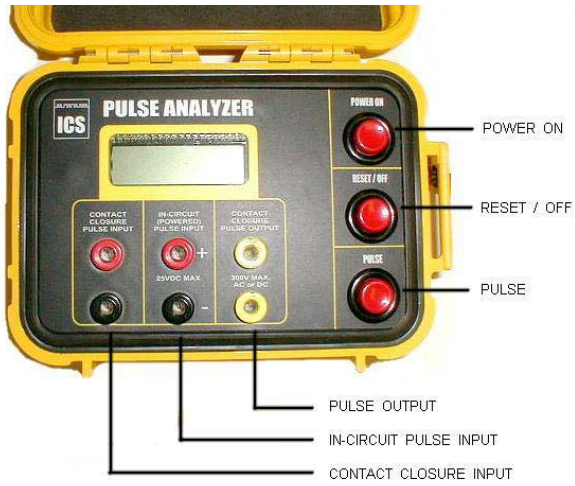
Another type of passive pulser is the open collector output. Some electronic dispensers such as the Gasboy 9800 series and the Gasboy Astra, have an internal circuit for generating a pulse output. This output uses a transistor to switch the pulse signal to DC ground only. This type of pulse output requires the console or card system to generate a voltage, which is then grounded to indicate a pulse. The V/R 7671 solid state pulse transmitter also has an open collector type output.

Below is a schematic representation of an open collector pulser:




Some consoles and card systems are not compatible with the open collector pulse output, while nearly all are compatible with contact closure types. Consult the wiring diagrams for your particular console or card system model. The PA1 pulse analyzer with operate with either type.

## III. PA1 Operation




The above diagram illustrates the connection points and switches on the PA1 pulse analyzer.

### Powering On and Off

To turn on the pulse analyzer, simply press the POWER ON button at the top right. The display will scroll the message “I.C.S. Pulse Analyzer”. After this message, the display will read 8888 for 1/2 second, then go blank for 1/2 second. This allows the operator to verify that all of the display segments are working correctly. After this test, the display should read 0000, indicating that the pulse analyzer is ready for operation.

To power the pulse analyzer off, press and hold the RESET / OFF button for 2 seconds. The display should go blank, indicating that the power is off. The pulse analyzer also has an automatic power off feature. If the pulse analyzer is left on for 5 minutes without a button being pressed or a pulse being counted, it will automatically shut off to conserve battery power.

## Resetting the Display

To reset the count on the pulse analyzer display to zero, press and release the RESET / OFF button.

## Digital Pulse Filtering

The pulse analyzer has a digital filter built into the pulse input circuitry. This filter operates in both contact closure and in-circuit test modes. It allows only one pulse in each 5 millisecond interval. This equates to 200 pulses per second. Some mechanical switch pulsers such as the V/R 1871 generate contact bounces during operation. The digital filter causes the pulse analyzer to ignore these bounces, and to read only the correct pulse count.

Some pulser configurations generate a very high speed count, (High speed being in the range of 60 gallons per minute with a 100 pulse per gallon pulser. 100 pulses per second or more.) For this application, the pulse analyzer has a high speed mode. To put the pulse analyzer in high speed mode, turn it off by pressing the RESET / OFF button for 2 seconds. Now hold the PULSE button down while pressing the POWER ON button. Keep holding the PULSE button down until the pulse analyzer display reads 8.8.8.8. The pulse analyzer is now in high speed mode. High speed mode is indicated on the display when all of the decimal points are on. In high speed mode, the digital filter circuit of the pulse analyzer is set to 1 pulse every 1 millisecond. This allows a maximum pulse frequency of up to 1000 pulses per second.

## Pulse Triggering

The pulse analyzer is designed to trigger a count on the closing of the contacts in contact closure mode, or on the rising edge of the voltage in In-Circuit mode. This is usually how consoles and card systems operate. If you have an application which requires the pulse analyzer to trigger on the opening of the contacts or on the falling edge of the voltage, the pulse analyzer can be set to accommodate this.

To set the pulse analyzer to trigger on the opening of the contacts in contact closure mode and on the falling edge of the signal on in-circuit mode, make sure the pulse analyzer is off. Put the leads in the contact closure position and clip the red and black leads together. Now turn the pulse analyzer on by pressing the POWER ON button.

## Testing a Contact Closure Pulser

To test a contact closure pulser, first make sure that the pulser is not attached to the console or card system. There should be no voltage on the pulser's output wires. Plug the PA1 leads to the leftmost red and black terminals labeled "Contact Closure Pulse Input". Connect the leads to the output wires of the pulser. If the pulser is an open collector type, connect the red lead to the positive side, and the black lead to the negative. If the pulse is not an open collector type, polarity is not important.

If the pulser requires power to operate, turn this power on. Now operate the pump and dispense fuel. If the pulser is working properly, the output count should be displayed on the pulse analyzer display. Note that the display does not display the decimal point. It displays a pulse count only.

When the test leads are in the contact closure plugs, the pulse analyzer sends 9 volts DC out on the red lead, and looks for the pulsed 9 volts DC on the black lead. A pulse is triggered if the voltage on the input wire rises above 1.25 volts DC.

## Testing a pulser In-Circuit

If the pulser being tested has voltage on its output leads, then it must be tested using the In-Circuit mode. This mode can be used to test contact closure pulsers that are still connected to the console or card system, or it can be used to test active pulsers which generate a voltage for their pulse output. Keep in mind that the pulser analyzer can only handle voltages of up to 25 Volts DC. Connecting the pulse analyzer to any voltage higher than this can damage it.

To test a pulser In-Circuit, plug the red and black leads to the red and black terminals respectively on the pulse analyzer. On the pulser wiring, determine which wire or terminal is more positive than the other. Many card systems and consoles will indicate which are the positive and negative pulse terminals. Connect the red lead to the positive and the black lead to the negative terminal, or to the system's DC ground. The pulse analyzer should now display the pulse count when the pump is in operation.

The pulse analyzer will trigger a count when the voltage difference between the positive and negative leads is greater than 1.25 volts DC.

## Generating an output pulse

In order to test that a console or card system is correctly reading pulses, the pulse analyzer can generate a contact closure pulse. To use this feature, first make sure that all field wiring is disconnected from the pulse input terminals on the console or card system. Now plug the pulse analyzer leads into the rightmost yellow terminals labeled "Contact Closure Pulse Output". Connect the leads to the pulse input terminals of the console or card system and press the RESET / OFF button on the pulse analyzer to reset the display. Now use the console or card system to activate a fueling transaction on the dispenser being tested and turn on the handle switch for the appropriate pump. You need not dispense any fuel from the pump. When the pump is on, press the PULSE button on the pulse analyzer. The pulse analyzer will output 10 pulses for each press of the PULSE button, and the display will record the output count. When enough pulses have been sent, turn the pump handle switch off and check that the reading of the console or card system matches the reading on the display of the pulse analyzer.

## Replacing the Battery

When the pulse analyzer switches off prematurely, or the operation becomes erratic, it may be time to replace the battery. The pulse analyzer uses a standard 9 Volt transistor battery. Alkaline batteries work best. To replace the battery, make sure the unit is off. With the cover open, turn the pulse analyzer over and remove the 5 screws on the back. Now gently tap on the back of the unit until the front panel of the pulse analyzer comes out of the enclosure. The battery will be visible on the rear of the panel. Replace the battery and reassemble the unit.

## Technical Support

If you have a problem with the pulse analyzer, or need help connecting it to your equipment, please call ICS technical support at: 972-522-1593, or email us at support@intconsys.com.

## Pulse Analyzer Connection Chart

The following chart show the correct connection of the pulse analyzer to commonly used pulsers.

| Contact Closure Pulser Testing<br>*Pulser output wires should be disconnected from any console or card system. Test Leads should be connected to "Contact Closure Pulse Input" terminals of the Pulse Analyzer.* | | | |
|---|---|---|---|
| **Pulser Manufacturer** | **Pulser Model** | **Red Lead To:** | **Black Lead To:** |
| Integrated Control Systems | SP1 | Red | Red |
| Integrated Control Systems | FR1 | Red | Red |
| Integrated Control Systems | GB1 | Red | Red |
| Integrated Control Systems | VR1 | Red | Red |
| Western Electronics / Emco Electronics / OPW | Model 400b | Red | Red |
| Western Electronics / Emco Electronics / OPW | Model 500 | Red | Red |
| Western Electronics / Emco Electronics / OPW | Model 800f | Red | Red |
| Western Electronics / Emco Electronics / OPW | Model 50 | Red | Red |
| Western Electronics / Emco Electronics / OPW | Model 788 | Red | Red |
| Veeder Root | 1871 | Black | Black |
| Veeder Root | 7671 | Black | White |

The following chart shows the correct connection of the pulse analyzer to some commonly used card systems and consoles.

| In-Circuit Pulser Testing<br>**Below are the correct connection points for In-Circuit testing on various manufacturers consoles and card systems** | | | |
|---|---|---|---|
| **Card Systems** | | | |
| **System Manufacturer** | **System Model** | **Red Lead To:** | **Black Lead To:** |
| Western Electronics / Emco Electronics / OPW | Phoenix 8000 | PUL-n | DC Ground |
| Western Electronics / Emco Electronics / OPW | Phoenix AFC | P-IN | DC Ground |
| Western Electronics / Emco Electronics / OPW | FL6 | | |
| OPW | K800 | | |
| OPW | System2 / C/OPT / CFN | | |
| OPW | K2500 | | |
| OPW | Keegard | | |
| Gasboy | Series 1000 / Fleetkey | | |
| Gasboy | Top Kat | | |
| Gasboy | Islander / Islander II | | |
| Gasboy | Keytrol | | |
| Cardlock Vending | Cardmaster | | |
| NBCS / E-Fueling | Fuel Guard | | |
| NBCS / E-Fueling | Fuel Manager | | |
| **Fuel Consoles** | | | |
| **System Manufacturer** | **System Model** | **Red Lead To:** | **Black Lead To:** |
| Western Electronics / Emco Electronics | Alpha I / Alpha II | | |
| Western Electronics / Emco Electronics | Sprint | | |
| Triangle Microsystems (TMS) | 800f | | |