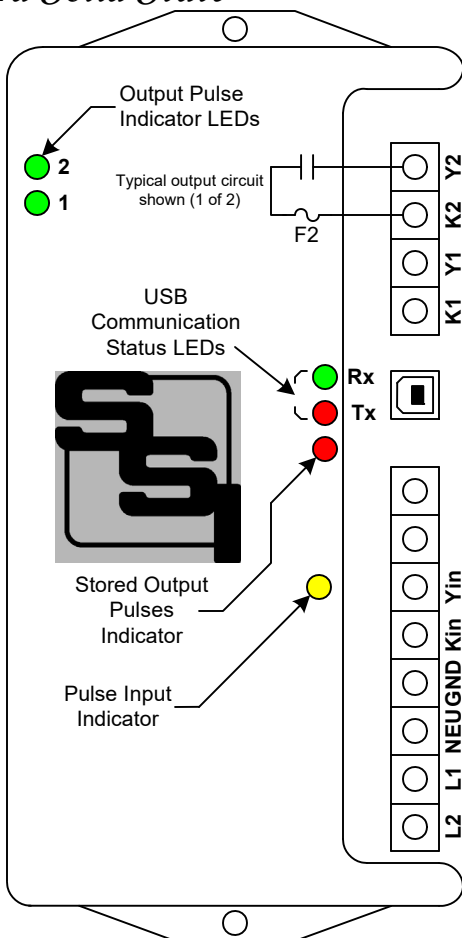


DPR-2

Standard Solid State

PROGRAMMABLE HIGH-SPEED DIVIDING PULSE RELAY INSTRUCTION SHEET



Y2 →
K2 ← **OUTPUT #2**

Y1 →
K1 ← **OUTPUT #1**

USB PROGRAMMING PORT

XVout**

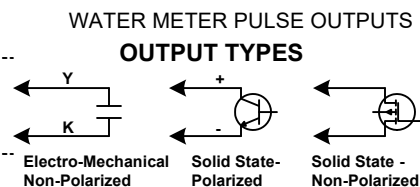
XVin*

Y ← **INPUT FROM**
K → **METER Common**

GND ←

NEU ←

POWER SUPPLY INPUT
120V ←
277V ←



* XVin used for -SP special configurations only and provides an input for external pulse voltage

** XVout provides an output power supply voltage for water meters up to 40mA on the standard DPR-2 configuration.

MOUNTING POSITION - The DPR-2 may be mounted in any position.

POWER INPUT - For a supply voltage of 120 VAC, connect the hot lead to the **L1** terminal. For 208 to 277VAC, connect the hot lead to the **L2** terminal. Only L1 or L2 can be connected. NOT BOTH. Connect the neutral lead to the **NEU** terminal. Connect the **GND** terminal to the electrical system ground. Ground must be connected for proper operation.

METER CONNECTIONS - The DPR-2 is compatible with 2-wire (Form A) dry-contact output metering systems. The DPR-2's "K" and "Y" input terminals should be connected to the meter's "K" and "Y" terminals. The DPR-2's "K" is common & provides the return from the meter's "K" terminal. The "Y" input provides a "pulled-up" +13VDC to the meter's "Y" terminal. In applications where the pulse output is polarized, the K terminal is negative (-) and the Y terminal is positive (+). No external voltage is necessary.

FUSES - The fuses are 3AG or AGC type and may be up to 1/10 Amp in size. Two 1/10 Amp fuses (F1 and F2) are supplied standard with the unit unless otherwise specified.

OUTPUTS - Two 2-wire dry-contact, isolated solid-state non-polarized outputs are provided on the DPR-2. MOV transient suppression for the contacts of the solid state relays is provided internally. Maximum current is 100mA(.1A). Maximum power dissipation is 800mW.

DPR-2 SETTINGS - All settings are programmed into the DPR-2 using the USB Programming port and the SSI Universal Programmer software or a terminal program. Download the SSI Universal Programmer software from the SSI website on the DPR-2 webpage under the documentation tab.



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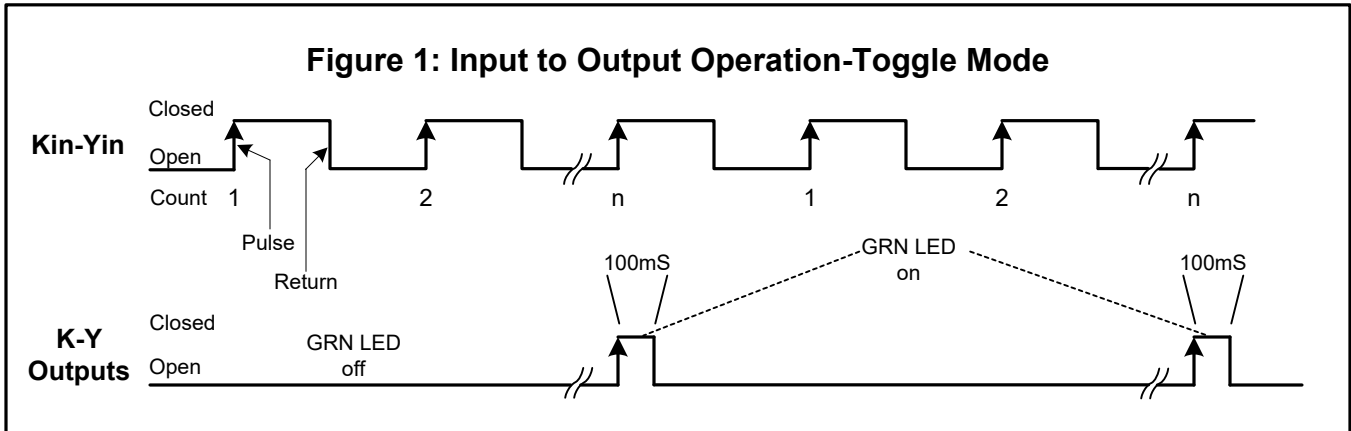
3852 Fortune Dr, Lafayette, IN 47905

Phone: (765) 449-5576

Mail: technicalsupport@radianresearch.com

DPR-2 OPERATING MODES

SIMPLE PULSE DIVIDER MODE: The DPR-2's simple Pulse Divider Mode allows an output to occur once a specific number of input pulses have been received from the meter. In Figure 1 below, a count is registered when the input closes and there is continuity between the Kin and Yin input terminals. The return to the original state (input open) does not count as a pulse. When the number of pulses received is equal to the preset count number, an output pulse is generated for a specified period of time. Figure 1 shows a pulse 100 mS long is generated when the DPR-2 receives "n" pulses from the meter.



PULSE CONVERSION MODE: The DPR-2's Pulse Conversion Mode allows an exact pulse value to be outputted when a specific number of gallons, kWh's or CCF's are received from the meter. Pulses may be entered directly as Gallons per Pulse or Pulses per Gallon in Water mode, Kilowatt-Hours per Pulse or Pulses per Kilowatt-hour in the Electric Mode or CCF's per pulse or Pulses per CCF in the Gas mode. Once a specified number of units is reached, an output pulse is generated for a specified period of time. In this way, the DPR-2 can be used as a pulse value converter. For example, let's assume that a water meter has a Contacts (Pulses) per Gallon value of 231.36. This means that each pulse is worth $1/231.36$ or .00432 Gallons. Let's assume you want an output pulse to be equal to 1 gallon. When the DPR-2 receives 232 pulses, an output pulse will be generated. The remainder of a pulse is equal to $232.00 - 231.36 = .64$. Thus, $.64 \text{ pulse} \times .00432 = .00276$ Gallon is left in the register to begin accruing the next gallon of water for the next output pulse. An output pulse representing 1 Gallon will be generated when exactly 231.36 input pulses occur.

INDEPENDENT OUTPUTS: The DPR-2 has two outputs that can be used independently, if desired, with unique output pulse values in both operating modes. The DPR-2 has a maximum of approximately 100 output pulses per second depending on programming.

STORED PULSES: If the number of pulses that is calculated to be generated exceeds the timing constraints of the DPR-2's programming, the DPR-2 can store or "cache" pulses to be generated up to 65,536. If any pulses are cached in memory, the RED Stored Output Pulses LED will light indicating that there are pulses to be outputted. Once the cached pulse register is empty and all stored pulses have been outputted, the RED LED will go off.

LED INPUT & OUTPUT INDICATORS: The DPR-2 includes a high-brightness Amber LED for the input and Green LEDs for the outputs. The Amber LED will light when the input is active. The Green LEDs will light when the output is "closed".

Programming the DPR-2

Setting up the Serial Port

The USB serial port is used for both monitoring and programming the DPR-2. Connect the "A" end of a USB A-B Type serial cable to the computer's USB port. Connect the other end to the DPR-2's USB Type "B" connector located between the input and output terminal blocks. With TeraTerm, Puddy, ProComm or some similar terminal program, select the correct COM port to be used, set the baud rate at **57600** and the terminal mode Receive as CR. Also make sure that the local echo is enabled (checked) or "ON". You will not see the values that you typed in on the screen unless the local echo is enabled on your terminal software. Alternately, download the **SSI Universal Programmer** from <http://solidstateinstruments.com/productpages/dpr-2-dividing-pulse-relay.php>

Turn on power to the DPR-2 and after the very short initialization process, the DPR-2 will be ready to accept programming commands and data. Press the "R" key and <Enter> to read back all current programmed parameters:

Mode: Pulse Divider
Debounce: 10ms
Pulses/Gallon: 100.0
Pulse Input Value: 0.01
Pulse OnTime: 100ms
Pulse OffTime: 30ms
Pulse Divider #1: 1.0
Pulse Divider #2: 1.0

Program the Units of Measure

To program the Units as Gallons use the "U0" command and press <Enter>. For Electric use U1 and <Enter>. For Gas use U2 and <Enter>. Case does not matter. The DPR-2 will respond:

Pulses/Gallon: 231.36
Gallons/Pulse: .00432

Program the Operating Mode

To set the operating mode to Simple Pulse Divider Mode, enter **md** or **MD** and press <Enter>.

To set the operating mode to Pulse Conversion Mode, enter **mc** or **MC** and press <Enter>. The DPR-2 will respond:

Mode: Pulse Divider

Programming # of Input Pulses: For the Simple Pulse Divider mode, simply enter the number of input pulses for each output pulse on each output channel.

For Output #1, enter **D1xxxxx** and press <Enter>.

For Output #2, enter **D2xxxxx** and press <Enter>. The allowable range of xxxx for both channels is from 0.00001(a number greater than zero) to 100000.0. For example, to set 100 pulses as the number of pulses required for an output pulse on Output #1, enter D1100 and press <Enter>. The DPR-2 will respond:

Pulse Divider #1: 100

Programming the Input Pulse Value for Pulse Conversion Mode:

In Pulse Conversion mode, you can enter the pulse value in units for water, electric or gas pulses. In general, the pulse value can be entered in one of two different formats: Pulses per Gallon or Gallons per pulse for water units. If you are entering a pulse value as Pulses per Gallon, enter the **Pxxxxx.x** command, where xxxxx.x is the number of pulses per gallon and <Enter>. If you are entering the pulse value as Gallons per Pulse, enter the **Gxxxxx.x** command, where xxxxx.x is the number of gallons per pulse and <Enter>. Upon hitting <Enter> the DPR-2 will return:

Pulses/Gallon: 231.36
Gallons/Pulse: .00432

DPR-2 Programming (cont)

Setting the Input Debounce

The DPR-2 has four debounce settings to help reject electrical noise that could be misconstrued as a pulse. The settings are 0-3 are as follows: 0-500uS, 1-1mS, 2-5 mS and 3-10mS. This setting must be set lower than the expected pulse width of the water meter's output, but not too low to be of no value in rejecting noise, specifically transients coupled into the input pulse circuit usually from line voltage conductors that either cross or run parallel to the DPR-2's pulse input wires. For example, if the water meter's pulse is 10mS in duration, the debounce setting could be set to 5 mS, thereby ignoring anything shorter than 5mS. Use the "B" command to select the input debounce time desired: For example B2 and <Enter> selects a 5mS debounce time. The DPR-2's serial link will return the following:

Debounce Time: 5 mS

Setting the Output Pulse On Time

To set the pulse width or "on" time, use the oxxxx or Oxxxx command, from 5 to 1000 mS. Case does not matter. For instance, for 500mS pulse width enter O500 and hit <Enter>. The DPR-2 will respond with as follow:

Pulse OnTime: 500mS

Setting the Output Pulse Off Time

To set the minimum "off" time or space between pulses, use the fxxxx or Fxxxx command, from 5 to 1000 mS. Case does not matter. For instance, for 30mS minimum off time, enter F30 and hit <Enter>. The DPR-2 will respond with as follow:

Pulse OffTime: 30 mS

Pulse Conversion Mode Output Pulse Value

In Pulse Conversion Mode, you can independently set each of the two outputs to a specific number of Gallons (or other units) that each output pulse will represent. A common use case is to set an output for 1 gallon. When enough pulses of a specific value have been received, an output pulse will be generated. For example, assume that our water meter has an pulse output rating of 231.36 pulses per gallon. That means that each pulse is worth .00432 gallons. Assuming we want to have a pulse for each gallon, we set output #1 with the **D1** command to 1 gallon as follows: D11 and <Enter>. If we wanted to set output #2 for a pulse every 10 gallons, we'd use the **D2** command to set it for 10 gallons as follows: D210 and <Enter>. The output range is .00001 to 100000.0 Gallons/kWh's/CCF's. The decimal point can be put anywhere in between since the DPR-2 uses floating point math.

In the example above $1 \text{ Gallon (output)} / .00432 \text{ gallons per pulse (input)} = 231.481 \text{ pulses}$.

Therefore, once the DPR-2 receives the 232nd pulse from the water meter, an output will be generated on output #1. A remainder of $232.0 - 231.481 = .519 \text{ pulse} \times .00432 = .0022420$ gallons would be the remainder that is held in the accumulator register. In this case, each pulse adds .00432 gallons to the accumulation register, and because there is a remainder of .0022420 in the register, it takes only 231 pulses for the next output pulse to be generated. This time, there is a remainder of .000162 gallons remaining in the register. The next 231 input pulses is not enough to meet the 231.481 pulse per gallon setting, so 232 pulses must be received before the next pulse will be outputted. After the second output pulse, a remainder of .002402 remains in the register and the process continues with the DPR-2 doing the math each time a pulse is received.

Reading back all Programmable Parameters

To view the values of all programmable settings that are currently programmed into the DPR-2, press **R** and <Enter>. The USB serial link will return the following:

Mode: Pulse Divider
Debounce: 10ms
Pulses/Gallon: 100.0
Pulse Input Value: 0.01
Pulse OnTime: 100ms
Pulse OffTime: 30ms
Pulse Divider #1: 1.0
Pulse Divider #2: 1.0

DPR-2 Programming (cont)

Set Factory Defaults

If you find that you want to reset all parameters back to the factory defaults, simply press the **Z** or **z** key and <Enter>. The following parameters will default back to the factory settings shown above in the Reading back section.

Viewing the Firmware Version

In the event that the label on the DPR-2's microcontroller's label is lost or becomes unreadable, you can ask the DPR-2 what firmware version it has in it with the "V" command. Press **V** or **v**, then <Enter> and the serial link will return the following:

DPR-2 V1.2

List of DPR-2 Commands (?)

For help in selecting or using the serial commands with the DPR-2, simply press the **?** key. The serial link on the DPR-2 will return a full list of the commands.

h or ? for Help

md<CR> - Set Simple Divider Mode

mc<CR> - Set Pulse Conversion Mode

bX<CR> - Set input debounce, (X is 0-3).

gXXXXX.X<CR> - Set input pulse, Gallons/Pulse, (XXXXX.x is 0.00001 to 100000.0)

pXXXXX.X<CR> - Set input pulse, Pulses/Gallon, (XXXXX.x is 0.00001 to 100000.0)

oXXXX<CR> or OXXXX<CR> - Output pulse OnTime(ms), (xxxx is 5 to 1000).

fXXXX<CR> or FXXXX<CR> - Output pulse OffTime(ms), (xxxx is 5 to 1000).

'd1XXXXX<CR>' or 'D1XXXXX<CR>' - Set Divider Output #1, (XXXXX is .0000001 to 99999.9)

'd2XXXXX<CR>' or 'D2XXXXX<CR>' - Set Divider Output #2, (XXXXX is .0000001 to 99999.9)

ux<CR> - Set Units, (X is 0-2), 0-Water, 1-Electricity, 2-Gas

'r<CR>' or 'R<CR>' - Read Parameters.

'z<CR>' or 'Z<CR>' - Set Factory Defaults

'v<CR>' or 'V<CR>' - Query Firmware version.

If Electricity units are used then the input pulse values are set as follows:

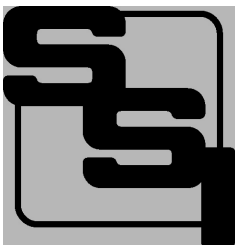
kXXXXX.X<CR> - Set input pulse, Kilowatt-hours/Pulse, (XXXXX.x is 0.00001 to 100000.0)

pXXXXX.X<CR> - Set input pulse, Pulses/Kilowatt-hours, (XXXXX.x is 0.00001 to 100000.0)

If Gas units are used then the input pulse values are set as follows:

cXXXXX.X<CR> - Set input pulse, CCF/Pulse, (XXXXX.x is 0.00001 to 100000.0)

pXXXXX.X<CR> - Set input pulse, Pulses/CCF, (XXXXX.x is 0.00001 to 100000.0)



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3852 Fortune Dr, Lafayette, IN 47905

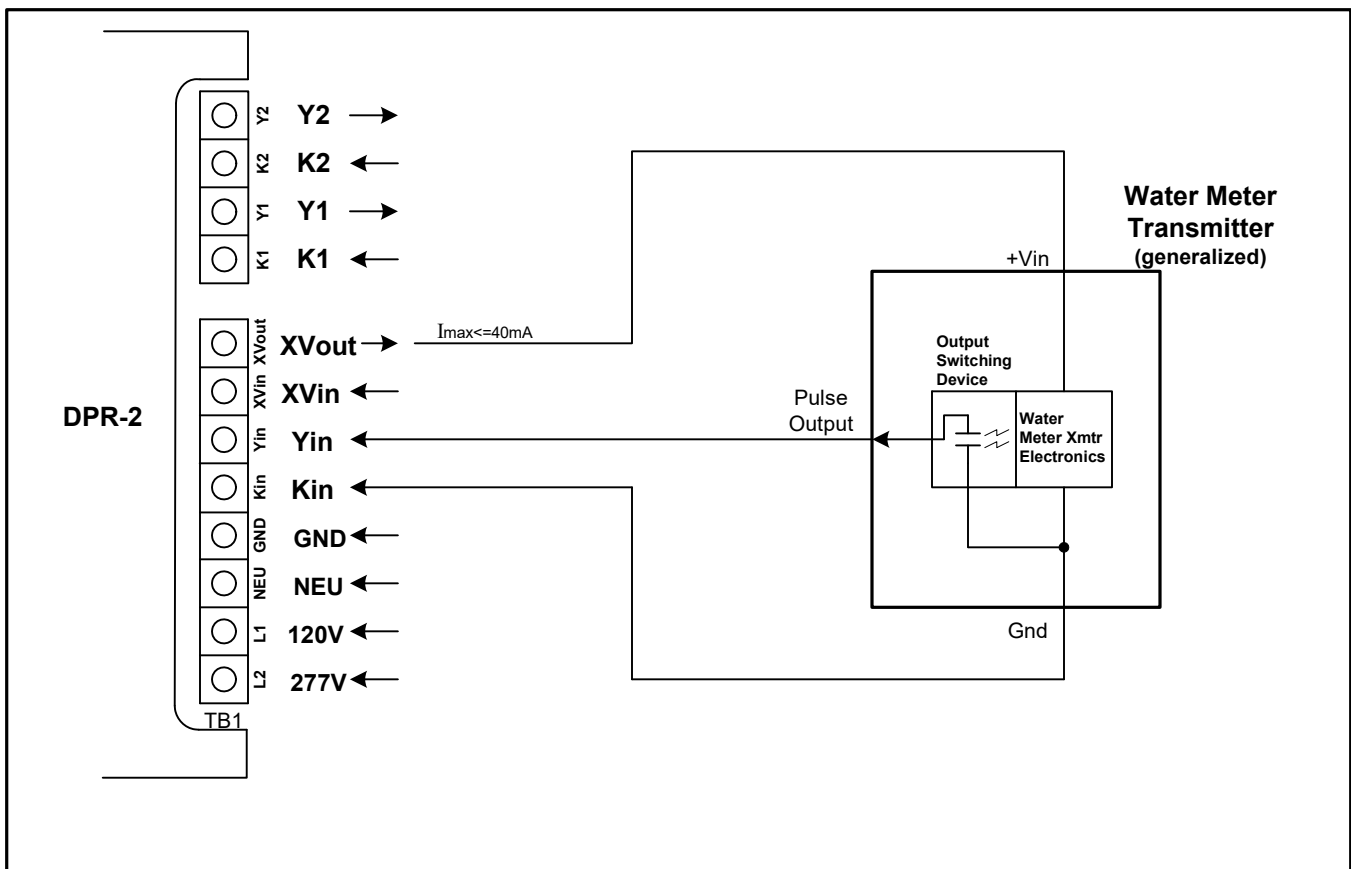
Phone: (765) 449-5576

Mail: technicalsupport@radianresearch.com

"We're all about K, Y and Z"

POWERING A WATER METER TRANSMITTER

+V OUTPUT: Some water meters require a DC power source to run the electronics ("transmitter") required to give a pulse output. In the event that you have a water meter with this requirement, the DPR-2 includes a power supply output terminal for this purpose. This terminal is marked "**XVout**" and is the 8th terminal up from the bottom. The voltage of this output pin varies with load between +12 and +18VDC. Current available on this pin to power the water meter transmitter is limited to 40mA. The drawing below shows the connection of the water meter to the DPR-2.



The DPR-2 supplies power via the XVout pin to the water meter's power supply terminal, often marked +V, +DC input or similar. The common ground or negative of the power supply connects to the "Kin" terminal of the DPR-2. It is important to note that this is the power supply ground as well as the common (return) for the pulse output. You will note in the drawing above that one terminal of the pulse output switching device is internally tied to the common ground terminal. This may vary from device to device but in general terms seems to be the most common configuration. The pulse output pin of the water meter connects directly to the "Yin" terminal. This usually requires a pull-up resistor between the +V input pin and the Yin terminal but the DPR-2 supplies this internally so the installer need not supply this. The XVin terminal is not used on the standard DPR-2 model.