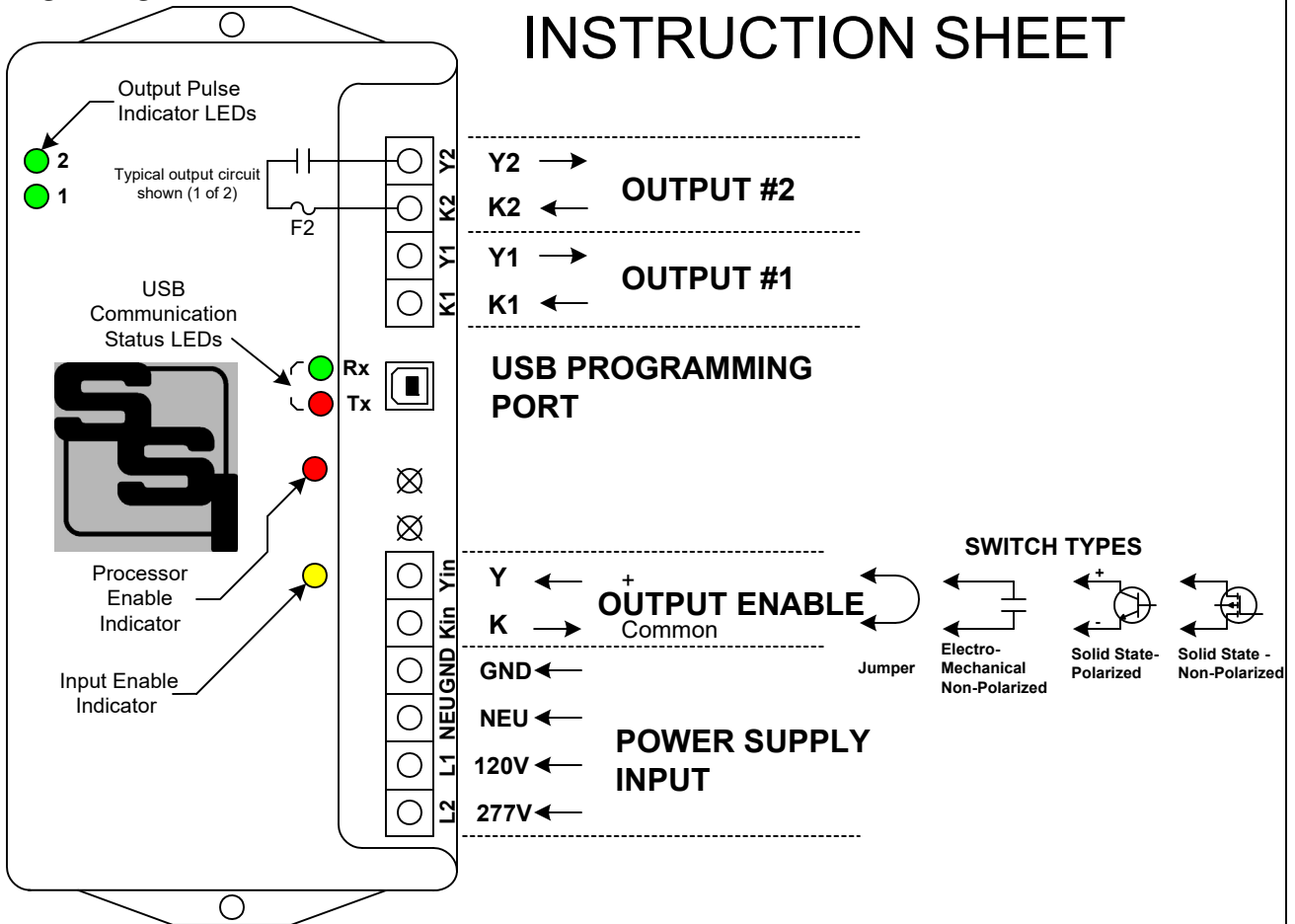


PPG-1

Standard Solid State

PROGRAMMABLE PULSE GENERATOR INSTRUCTION SHEET



MOUNTING POSITION - The PPG-1 may be mounted in any position.

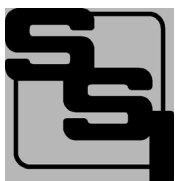
POWER INPUT - For a supply voltage of 120 VAC, connect the hot lead to the **L1** terminal. For 208 to 277VAC, connect the hot lead to the **L2** terminal. Only L1 or L2 can be connected. NOT BOTH. Connect the neutral lead to the **NEU** terminal. Connect the **GND** terminal to the electrical system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

ENABLE INPUT - The PPG-1 has a 2-wire (Form A) output enable input. With the input open, pulses are inhibited. Closing the input circuit will enable output pulses. This can be used as a start/stop switch once the output pulse sequence is triggered.

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 PPG-1. MOV transient suppression for the contacts of the solid state relays is provided internally. Maximum current is 100mA (.1A). Maximum power dissipation is 800mW. Maximum voltage is 120VAC/125VDC.

PPG-1 SETTINGS - All settings are programmed into the PPG-1 using the USB Programming port and a terminal program such as TeraTerm. Download the TeraTerm or similar software.



SOLID STATE INSTRUMENTS

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PPG-1 BASICS

PPG-1 PROGRAMMABLE PULSE GENERATOR DESCRIPTION: The PPG-1 is a simple and easy-to-use pulse generator designed to simulate pulses from an electric, water, gas, steam or other meter that has a dry-contact pulse output. This is useful in presenting different pulse scenarios or schemes to the pulse receiving equipment to ensure proper operation.

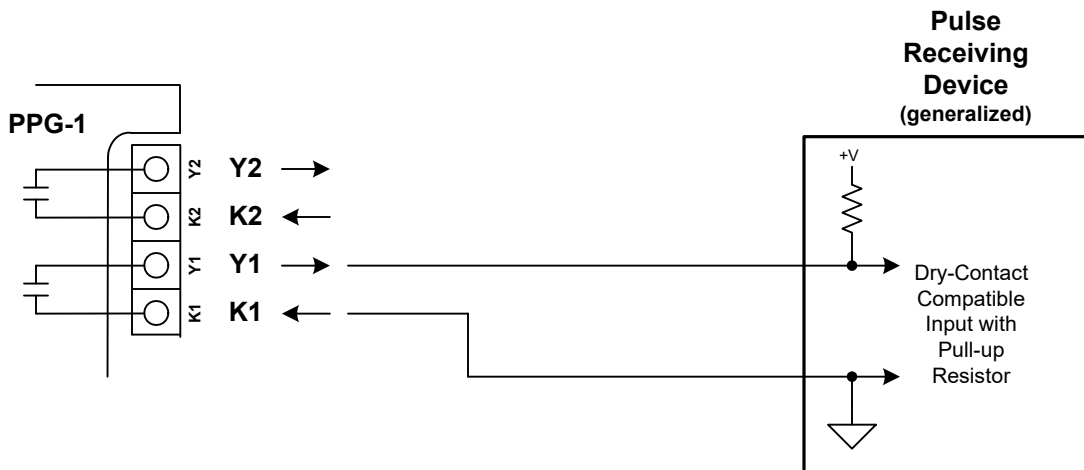
PPG-1 MODES OF OPERATION: The PPG-1 has three modes of operation: Continuous mode, One-Time mode and Interval mode. A terminal program such as TeraTerm or Puddy running on a PC initiates all operations.

INDEPENDENT OUTPUTS: The PPG-1 has two outputs that can be used independently. Both outputs can be used concurrently with unique on and off output times and are started and stopped independently with the trigger command.

HIGH/LOW PULSE RANGE: Two pulse ranges allow a wide range of pulse programming. The Low range is programmed in milliseconds over a range of 50 to 10,000 milliseconds (10 seconds) on time and off time. The High range is programmed in microseconds over a range of 500 to 100,000 microseconds (100 milliseconds) on and off time. Each output's range is independent of the other. On pulse widths less than 1 millisecond, the alternate output (high speed transistor output) configuration may need to be installed.

LED INPUT & OUTPUT INDICATORS: The PPG-1 includes a high-brightness Amber LED for the Enable input and Green LEDs for the outputs. The Amber LED will light when the input is active. The Green LEDs will light when a pulse is generated and the corresponding output is "closed" (has continuity).

INSTALLATION: Mount the unit if a permanent mounting location is desired. Connect the power source. Connect the pulse output device(s) to the output terminals. Connect the programming computer running TeraTerm or another Command Line Terminal program. Start generating pulses!

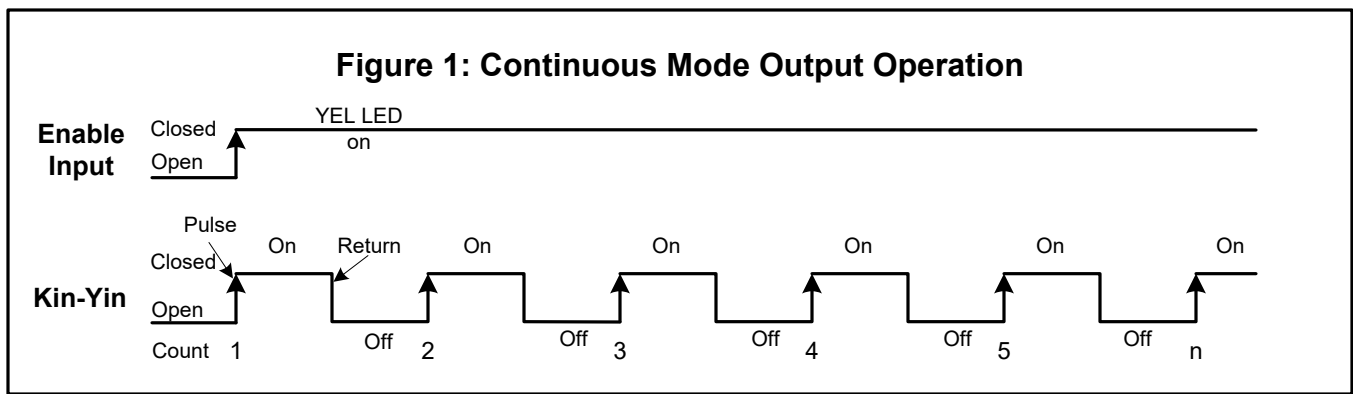


TYPICAL APPLICATION

PPG-1 OPERATING MODES

PPG-1 PULSE GENERATOR MODES: The PPG-1 can be operated in three pulse output modes: Continuous, One-Time or Interval mode. Each output channel of the PPG-1 can be configured independently. This means that each channel can have a different pulse mode, pulse width and/or different time between pulses. Both channels are set to default to the One-Time mode.

Continuous Mode: In Figure 1 below, Continuous Mode is shown. The user specifies a pulse "on" time and "off" time. Once triggered, the pulse output will continuously output pulses with the specified on and off times. Pulse may be interrupted temporarily by opening the Enable input.



(Refer to Page 8 for the complete Command Set)

Set the On time: press o1xxxxx, where 1 is channel number 1 in this example. Set the Off time: press f1xxxxx, where 1 is the channel 1 in this example. xxxxx is the number of microseconds in the high speed range or milliseconds in the low range.

To start the pulses, press Cx <Enter>, where x is either 1 or 2 for the channel number. To stop outputs pulses press the Sx key, where x is the channel #.

Example:

Let's assume you want a continuous pulse stream with 1 per second total duration. That is 500mS on and 500mS off.

Enter p11 <Enter> to set the pulse count at 1

Enter g10 <Enter> for Low range

Enter o1500 <Enter>

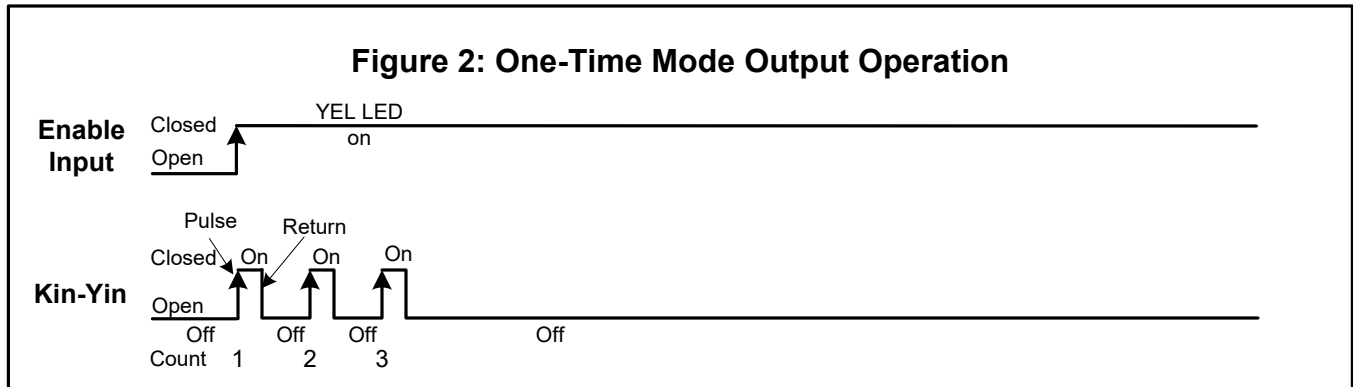
Enter f1500 <Enter>

Enter c1 <Enter>

Pulses will immediately start and continue until the stop command is given. To stop enter s1 <Enter>. The pulses will stop and the PPG-1 will return to the default One-Time Mode. To turn on again simple enter c1 <Enter>.

PPG-1 OPERATING MODES

One-Time Mode: The One-Time Pulse Mode allows a predetermined number of one or more pulses of a specified length to be outputted one time upon receiving the "Tx" trigger command. Specify the on-time, the-off time and the number of pulses. Upon receiving the trigger command the first pulse's on-time will begin. Once the predetermined number of pulses has occurred the PPG-1 will return to the standby state.



Set the On time: press o1xxxx, where x is channel number 1 in this example. Set the Off time: press f1xxxx, where x is either 1 or 2 for the channel number. xxxxx is the number of microseconds in the high speed range or milliseconds in the low range.

Set the Pulse Count desired: p1nnnnn where 1 is channel number 1 in this example, and n is the number of pulses. The interval must be set to 0 mS for the One-Time mode.

To start the One-Time sequence of pulses, press Tx <Enter>, where x is either 1 or 2 for the channel number. The sequence will begin and start outputting the number of pulses specified. Example:

Let's assume you want a One-Time pulse set of 3 pulses with 100mS on and 900mS off on Channel 2.

Enter g20 <Enter> to set Channel 2 to the Low Range

Enter o2100 <Enter> to set the On-time to 100mS

Enter f2900 <Enter> to set the Off-Time to 900mS

Enter p23 <Enter> to set the pulse count to 3 pulses

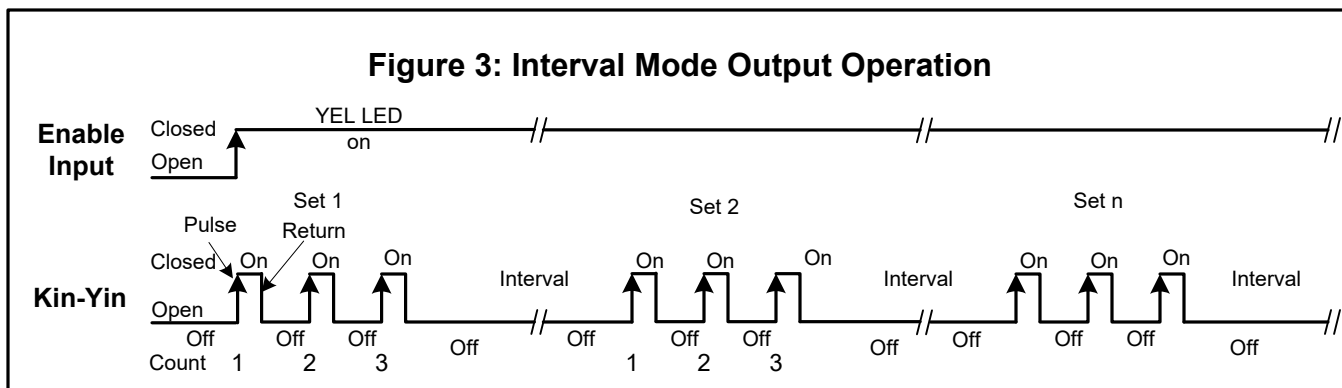
Enter i20 <Enter> to ensure that the interval is set to 0mS.

Enter T2 <Enter> to trigger the one-time sequence.

Three 100mS pulses will immediately be outputted with a 900mS spacing between pulses 1 and 2, and 2 and 3. This sequence will only occur once. It can be run again and again manually by entering the Tx trigger command.

Interval Mode: The Interval Pulse Mode is a combination of the Continuous and One-Time modes. It allows you to continuously repeat the one-time sequence at a specified time interval. In this way you can set up a predetermined number of one or more pulses of a specified length to be outputted at a periodic interval. This is initiated upon receiving the trigger command. Specify the on-time, the-off time, the number of pulses and the desired interval between sets of pulses. Upon receiving the trigger command, the first pulse set will begin. Once the "set", that is, the predetermined number of pulses has occurred the PPG-1 will time out the interval and then will repeat the sequence. To stop the sequence, use the Sx command and the PPG-1 will return to the the standby state (One Time mode).

Figure 3: Interval Mode Output Operation



Procedure:

Set the Range gxy <Enter> for the channel and range.

Set the On time: press o1xxxxx, where 1 is channel 1 in this example.

Set the Off time: press f1xxxxx, where 1 is channel 1 in this example. xxxxx is the number of microseconds in the high speed range or milliseconds in the low range.

Set the Pulse Count desired: pxnnnnn where x is the channel number 1 or 2, and n is the number of pulses.

Set the Interval time: icy <Enter> up to 10 seconds where x is the channel number and y is the number of milliseconds up to 10,000 (10 seconds).

To start the One-Time sequence of pulses, press Tx <Enter>, where x is either 1 or 2 for the channel number. The sequence will begin and start outputting the number of pulses specified.

Start the sequence with the trigger Tx command. Stop the sequence with the Sx command.

Example:

Let's assume you want a pulse set of 7 pulses with 400mS on and 1600mS off on Channel 1 with 10 second spacing between sets.

Enter g10 <Enter> to set Channel 1 to the Low Range.

Enter o1100 <Enter> to set the On-time to 100mS.

Enter f1500 <Enter> to set the Off-Time to 500mS.

Enter p17 <Enter> to set the pulse count to 7 pulses.

Enter i15000 <Enter> to set the interval length between sets to 5,000 milliseconds (5seconds).

As soon as you hit <Enter> the sequence will start and seven 100mS pulses will immediately be outputted with a 500mS spacing between pulses. After the 7th pulse, the interval spacing of 5000mS (5 seconds) will time out and the 7 pulse output set will repeat. This sequence will occur continuously until stopped. To stop the sequence, press i10 <Enter> which sets the interval to 0mS. To start the sequence again, simply enter the interval spacing desired.

Programming the PPG-1

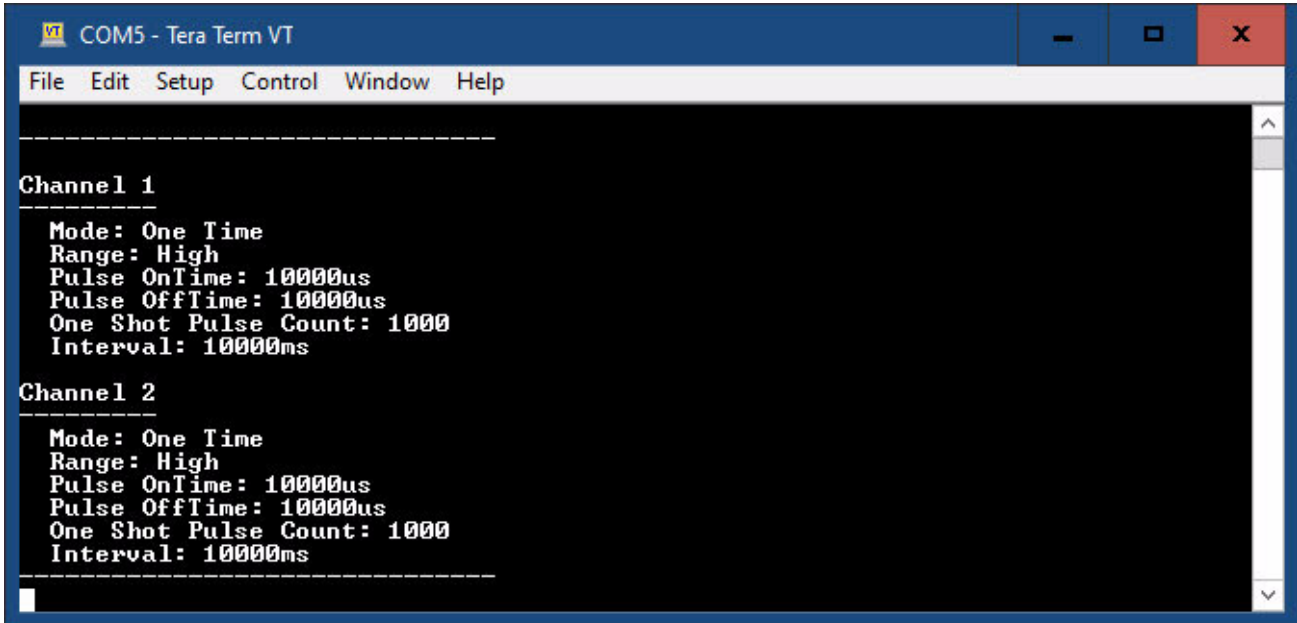
Setting up the USB Serial Port

The USB serial port is used for both monitoring and programming the PPG-1. Connect the "A" end of a USB A-B Type serial cable to the computer's USB port. Connect the other end to the PPG-1's USB Type "B" connector located between the input and output terminal blocks. With the TeraTerm 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.

Turn on power to the PPG-1. Press the "V" key and <Enter> to read back the firmware version of the PPG-1:

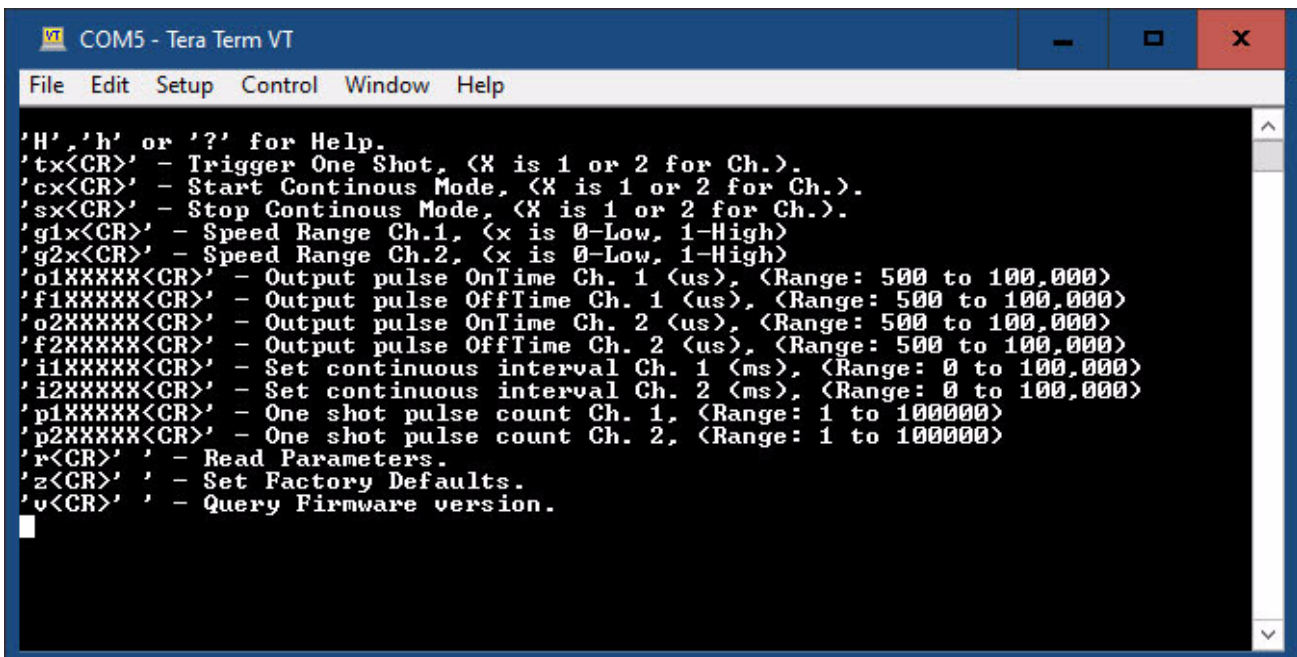
PPG-1 Version 2.1

Press the "R" key and <Enter> to read back all current programmed parameters similar to:



```
COM5 - Tera Term VT
File Edit Setup Control Window Help
-----
Channel 1
Mode: One Time
Range: High
Pulse OnTime: 10000us
Pulse OffTime: 10000us
One Shot Pulse Count: 1000
Interval: 10000ms
-----
Channel 2
Mode: One Time
Range: High
Pulse OnTime: 10000us
Pulse OffTime: 10000us
One Shot Pulse Count: 1000
Interval: 10000ms
-----
```

Press the "H" or "?" key and <Enter> for the command menu:



```
COM5 - Tera Term VT
File Edit Setup Control Window Help
'H', 'h' or '?' for Help.
'tx<CR>' - Trigger One Shot, (X is 1 or 2 for Ch.).
'cx<CR>' - Start Continous Mode, (X is 1 or 2 for Ch.).
'sx<CR>' - Stop Continous Mode, (X is 1 or 2 for Ch.).
'g1x<CR>' - Speed Range Ch.1, (x is 0-Low, 1-High)
'g2x<CR>' - Speed Range Ch.2, (x is 0-Low, 1-High)
'o1XXXXXX<CR>' - Output pulse OnTime Ch. 1 (us), (Range: 500 to 100,000)
'f1XXXXXX<CR>' - Output pulse OffTime Ch. 1 (us), (Range: 500 to 100,000)
'o2XXXXXX<CR>' - Output pulse OnTime Ch. 2 (us), (Range: 500 to 100,000)
'f2XXXXXX<CR>' - Output pulse OffTime Ch. 2 (us), (Range: 500 to 100,000)
'i1XXXXXX<CR>' - Set continuous interval Ch. 1 (ms), (Range: 0 to 100,000)
'i2XXXXXX<CR>' - Set continuous interval Ch. 2 (ms), (Range: 0 to 100,000)
'p1XXXXXX<CR>' - One shot pulse count Ch. 1, (Range: 1 to 100000)
'p2XXXXXX<CR>' - One shot pulse count Ch. 2, (Range: 1 to 100000)
'r<CR>' - Read Parameters.
'z<CR>' - Set Factory Defaults.
'u<CR>' - Query Firmware version.
```

PPG-1 Programming (cont)

NOTE: The following examples all use Channel 1 but are the same for Channel 2.

Setting the Range

The PPG-1 has two ranges High and Low. High range is the microsecond range while Low is the millisecond range. G or g is the range command letter followed by the channel number 1 or 2, followed by 0 for Low Range or 1 for High Range. Low range output times can be set from 50 to 10,000 milliseconds, while the High range can be set from 500 to 100,000 microseconds. Enter G10 <Enter> to set Channel 1 to the Low range. The PPG-1's serial link will return the following:

Channel 1

Range: Low

Setting the Output Pulse On Time

To set the pulse width or "on" time, use the o1xxxx or O1xxxx command for channel 1, from 50 to 10000 mS. Case does not matter. For instance, for 500mS pulse width enter O1500 and hit <Enter>. The PPG-1 will return the following:

Channel 1

Pulse OnTime: 500mS

Setting the Output Pulse Off Time

To set the "off" time or space between pulses, use the f1xxxx or F1xxxx command, from 50 to 10000 mS. Case does not matter. For instance, for 1 second off time, enter F11000 and hit <Enter>. The PPG-1 will return the following:

Channel 1

Pulse OffTime: 1000mS

Setting the Interval Time

To set the interval width or spacing time, use the i1xxxx or I1xxxx command for channel 1, from 1 to 100000 mS. Case does not matter. For instance, for 10,000ms (10sec) interval width, enter I110000 and press <Enter>. The PPG-1 will return the following:

Channel 1

Interval: 10000mS

Setting the Pulse Count

To set the one time pulse count, use the p1xxxx or P1xxxx command for channel 1, from 1 to 100000 pulses. Case does not matter. For instance, for 27 pulses, enter P127 and press <Enter>. The PPG-1 will return the following:

Channel 1

One Shot Pulse Count: 27

Trigger the One Shot

To start the one-time pulse or interval pulse modes, use the t1 or T1 command for channel 1. Case does not matter. To start press T1 <Enter>. The PPG-1 will return the following:

Ch. 1 Triggered

PPG-1 Programming (cont)

Start the Continuous Mode

To start the continuous mode, use the c1 or C1 command for channel 1. Case does not matter. To start, press C1 <Enter>.

The PPG-1 will return the following:

Channel 1

Mode: Continuous

Stop the Continuous Mode

To stop the continuous or interval modes, use the s1 or S1 command for channel 1. Case does not matter. To stop, press S1 <Enter>

The PPG-1 will return the following:

Channel 1

Mode: One Time

This means that it has stopped and reverted back to the default One Time mode.

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 PPG-1's microcontroller's label is lost or becomes unreadable, you can ask the PPG-1 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:

Programmable Pulse Generator V2.1

List of PPG-1 Commands (?)

For help in selecting or using the serial commands with the PPG-1, simply press the ? or the H key, and <Enter>. The serial link on the PPG-1 will return a full list of the commands.

'H','h' or '?' for Help.

'tx<CR>' - Trigger One Shot, (X is 1 or 2 for Ch.)

'cx<CR>' - Start Continuous Mode, (X is 1 or 2 for Ch.)

'sx<CR>' - Stop Continuous Mode, (X is 1 or 2 for Ch.)

'g1x<CR>' - Speed Range Ch.1, (x is 0-Low, 1-High)

'g2x<CR>' - Speed Range Ch.2, (x is 0-Low, 1-High)

'o1XXXXX<CR>' - Output pulse onetime Ch. 1 (ms), (Range: 50 to 10,000)

'f1XXXXX<CR>' - Output pulse OffTime Ch. 1 (ms), (Range: 50 to 10,000)

'o2XXXXX<CR>' - Output pulse onetime Ch. 2 (ms), (Range: 50 to 10,000)

'f2XXXXX<CR>' - Output pulse OffTime Ch. 2 (ms), (Range: 50 to 10,000)

'i1XXXXX<CR>' - Set continuous interval Ch. 1 (ms), (Range: 0 to 100,000)

'i2XXXXX<CR>' - Set continuous interval Ch. 2 (ms), (Range: 0 to 100,000)

'p1XXXXX<CR>' - One shot pulse count Ch. 1, (Range: 1 to 100000)

'p2XXXXX<CR>' - One shot pulse count Ch. 2, (Range: 1 to 100000)

'r<CR>' - Read Parameters.

'z<CR>' - Set Factory Defaults.

'v<CR>' - Query Firmware version.