

Digital Slave Unit: Operating Notes for Version 4

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1 Software Revisions

Version	Used on	Comments
1v9	“digital upgrade kits”	Original issue
2v1	Used on all pre-prod'n models and early kits	See “Digital Slave Unit: Operating Notes for Versions 1 to 3”
3v1	Samples shipped to Firefly on 25-Oct-05.	See “Digital Slave Unit: Operating Notes for Versions 1 to 3”
4v3	17-Dec-05	This issue adds a “permanent learning” mode, and a programmable delayed flash, as well as other minor changes Flash Detection Time Window: On previous issues of software, the flash pulses must all be present within a 1s time window. For the present issue this behaviour has been altered so that the pulse detection terminates 1s after the last flash pulse is received. For normal operation, this makes little difference, but it does allow detection of red-eye reduction pulses where the overall duration is longer than 1s. This issue of software is expected to be in production for some time, so it is described in full below.
4v3a	14-Feb-06	Special Issue: The green ‘fired’ LED lights for 2s, not 8s.

2 Operating Instructions for Version 4

As well as operating as a conventional slave unit, this unit can be programmed by the user to count the number of pulses from a flashgun and to fire a slave unit only after the required number of pulses has been detected. This means that it will work with digital cameras, whose internal flashguns often fire a double pulse, and with cameras that have a red-eye reduction facility that fires the built-in multiple times.

When the battery is first inserted, the unit powers up in the two pulse mode. It will fire the slave unit after the *second* flash pulse is detected.

Changing the Operating Mode

To change the operating mode, press the Restart/Fire button, then the Mode button. This causes the slave unit to enter its Learning Mode.

In detail, this is what happens: Pressing Restart/Fire fires the slaved flashgun (useful as a test) and activates the slave unit. (There is no on/off switch, but pressing Restart/Fire has, essentially, switched the unit on. The red LED then blinks a number of times to report how many pulses the slave unit is currently programmed to receive. Next, the green LED lights for 8s to indicate that the unit has fired. During this period, if you press the Mode button, the unit will enter its Learning mode and the red LED will light to indicate this.

In Learning Mode, you now have three options:

Manual Learning mode: The unit will count how many times you subsequently press the Mode button, and store this number in its memory, to use as the number of flash pulses it should count. If you pause for 3s, the unit will revert to standby and the red LED will go off.

Automatic Learning Mode: Whilst the red LED is lit, fire your camera or flashgun. The unit will count the number of pulses – including any red-eye reduction pulses – and store this number. The unit stops counting pulses 1s after the last pulse has been received. It will then flash the red LED for 8s with the code that means ‘flash pulses received but slave wad not fired’. The unit then reverts to standby.

Permanent Learning Mode: If you do nothing when the unit is in Learning Mode then, after 15s, it will time out and set a Permanent Learning Mode. The green LED will flicker rapidly for 8s to indicate this mode and the unit will then revert to standby. In Permanent Learning Mode the unit counts the pulses from the flashgun on each shot and updates its internal memory so that it expects this number of pulses next time. It does this every time it receives a train of pulses – i.e. it learns from its past mistake each time it is used. To cancel Permanent Learning Mode, re-enter the Programming Mode and program the unit by one of the other methods.

Reporting the Status

Did the slave unit fire? When the slave unit has received some flash pulses, it reports whether there was the correct number to fire the slave unit (steady or rapidly flickering green), too few (flashing red) or too many (flashing green). In Permanent Learning Mode, the steady green is replaced by a rapidly flickering green. During the period of 8s whilst the status LEDs are lit, the mode button can be pressed to enter Learning Mode. After 8s the LEDs go out and the unit reverts to standby. The slave unit cannot be re-triggered by a flashgun whilst the status LEDs are lit.

How many pulses is the device programmed for? When the Restart/Fire button is pressed the red LED blinks a number of times to report how many pulses the slave unit is currently programmed to receive. Next, the green LED lights for 8s to indicate that the unit has fired. If the unit is in Permanent Learning Mode the steady green is replaced by a rapid flickering.

Low battery warning: If, during the steady (or rapidly flickering) green that means ‘unit fired’, there is a short double red pulse repeated every 2s, this indicates that the battery is low and should be replaced. This warning also occurs when a new battery is first inserted – see the information sheet.

Specialised Operations

Delayed Fire Mode

If the Mode button is held down whilst Restart is pressed and released, the unit enters a Delayed fire mode. If this mode should be entered by accident, it can easily be cleared by pressing the Restart button. This will re-set the unit to the **two pulse** mode of detection.

The delay is set from the number of flash pulses that the unit has been programmed to count. If the unit has previously been programmed to fire after N pulses then, when it is set to Delayed Fire mode, the delay will be 2^N ms. That is...

$N=1 \Rightarrow 2$ ms. $N=2 \Rightarrow 4$ ms. $N=3 \Rightarrow 8$ ms. $N=4 \Rightarrow 16$ ms. $N=5 \Rightarrow 32$ ms. $N=6 \Rightarrow 64$ ms. $N=7 \Rightarrow 128$ ms. $N=8 \Rightarrow 256$ ms.

Setting delays longer than $N=8$ may cause unexpected results. Because the default setting for N is 2, the default delay is 4ms. Setting Delayed Fire Mode clears Permanent Learning Mode. Delayed Fire mode is cancelled by pressing the Restart/fire button. This will clear Delayed Fire mode and set the number of flash pulses to be counted to **two**.

When Delayed Fire mode is set, the status LEDs will give N double-flashes. To verify the delay, you should re-specify Delayed Fire mode by holding Mode whilst Restart is pressed and released. Simply

pressing Restart does not allow you to verify the operating mode, because this action resets the mode to **two pulse**.

After programming N pulses, the unit must be allowed to time-out and go into standby (3s after last button press). If Fire/Restart is pressed during this time, the stored value of N does not get transferred to the Delayed Fire register. The unit still operates correctly, but when Delayed Fire mode is subsequently set, it will use the previous value of N , instead of the current value. This precise cause of this behaviour has been identified, but there are no plans to correct it.

Battery Calibration

The unit is shipped with a low-battery threshold set to approximately 3.4V (*This may be changed on future versions*). It should not be necessary to alter this, and the following description is included only for completeness. These instructions will probably not be issued to customers who buy ready-built units.

An accurate low-battery warning can only be obtained by 'training' the unit to recognise a low battery condition. The training works by recording the supply voltage at the time the unit is trained, and using this as a reference for future warnings.

The unit will cease to work properly if the supply drops below 3V, so you could calibrate the low-battery condition using a 3V battery. However, 3V is well below the end-point of the silver-zinc cells used, and it would make more sense to calibrate it with three 'flat' silver-zinc cells at about 3.3–3.6V

To calibrate the unit...

1. Press the Restart button to activate the Mode button.
2. Whilst the Green LED is lit, press and hold the Mode button for at least 15s (or 8s if the unit is already in Learn Mode)

1.

3. Eventually, the Green LED will give a brief double-flash. Release the Mode button.
4. The unit will blink the red and green LEDs twice to indicate that the battery voltage has been recorded. The operating mode is reset to the default power-up condition.

Notes:



- If the LEDs blink only once, the voltage has not been recorded.
- You cannot erase this value – you can only record a new one.
- The low battery indication does not inhibit the operation of the slave unit – it is just a warning.
- The unit will not accept a training voltage greater than about 3.5V. *This may be changed on future versions*

Using the Software with the “Digital Upgrade Kit”

The “digital upgrade kit” is a small kit of parts that is intended as an add-on to my original slave unit. The original software issued for this kit was version 1v9. The latest version 4 software will work, but there is an issue to do with the low-voltage warning.

As described above, the low-voltage warning will be issued at around 3.4V. The lithium cell used with my original slave unit has a terminal voltage of 3.6V. It is possible, therefore, that the low voltage warning will be triggered before the battery is completely dead. However, in practice, the voltage drops rapidly as the battery becomes exhausted and so 3.4V might be an appropriate voltage for a *warning*. If it seems to be triggering when the battery is still clearly a long way from being dead, you should calibrate the unit as described above, using a 3V battery.

3 Information Sheet – Revised for software 4v3

Specification	Status LEDs	Restart / Fire Button
<p>Run Modes</p> <ul style="list-style-type: none"> Standard fires after one pulse Two-pulse fires after two pulses Multi-Pulse fires after a number of pulses Delayed Fire fires after a short delay <p>Learning Modes</p> <ul style="list-style-type: none"> Manual Set number of pulses Automatic Counts flashgun pulses Permanent Auto, on each shot <p>Flash Pulses</p> <ul style="list-style-type: none"> Minimum delay between pulses 2ms Maximum delay between pulses 1s Maximum pulses counted 255 Delayed-Fire delay 2–256ms <p>Controls</p> <ul style="list-style-type: none"> Restart/Fire Button for manual firing Mode/Learn Button for programming Operating mode LEDs to show ... Firing status Low battery <p>Power Requirement</p> <ul style="list-style-type: none"> 3 x SR44 / 357 Silver Oxide cells (1.5V, 170mAh) Standby current <10µA Battery life at least 2 years / 20,000 ops. If unit is to be unused for some time, remove Link 2 (inside case) to disconnect batteries <p>Output Rating</p> <ul style="list-style-type: none"> Trigger type: electronic (triac) Switching voltage: 400V max Switching current 10A max (peak) 800mA max continuous* <p>* or 100mA if resettable fuse (FS1) is fitted, if using flashbulbs without a capacitor-discharge firer you are advised to ensure that FS1 is fitted and that J1 is open-circuit.</p> <p>Output Setting (Internal Link LK1)</p> <ul style="list-style-type: none"> Position 1 for flashbulbs and "most" flash-guns; position 2 for "all" guns, but not bulbs. <p>Physical Information</p> <ul style="list-style-type: none"> Dimensions 60 x 41 x 18mm Weight 60g <p style="text-align: right;"><i>Punch this hole to attach a lanyard</i></p>	<p>1. After receiving flash pulses, the LEDs will light for 8s with the following meaning</p> <p>GREEN means 'fired'</p> <ul style="list-style-type: none"> Steady fired correctly Rapidly fired correctly in the Permanent Learning Mode Flickering fired, but extra flash pulses were received Flashing <p>RED means 'did not fire'</p> <ul style="list-style-type: none"> Learn Mode Steady did not fire; too few flash pulses received Flashing <p>2. After Pressing the Restart/Fire button, the LEDs will light as follows</p> <ul style="list-style-type: none"> i) The Red LED will blink steadily a number of times, to indicate the number of flash pulses the unit is programmed to detect. For the Standard setting this is one; for the usual 'digital camera' setting it is two. or The Red LED will give a series of double-flashes to indicate the specialised Delayed Fire setting. Press Restart to cancel this mode. See <i>additional documentation</i>. ii) The Green LED will light steadily for 8s to indicate that the unit has fired. or The Green LED will flicker rapidly for 8s to indicate that the unit has fired and that it is in the Permanent Learning Mode. if, during this time, the Red LED gives a very brief double-flash, repeated with 2s interval this is 'low battery'. iii) Finally, there will be a brief simultaneous flash of Red and Green LEDs. This is part of a self-test feature. One action during this time is that the battery voltage is checked. <p>3. At power up: When you insert a battery the red and green LEDs will blink alternately. The unit will initialise to Two-Pulse Setting. The Green LED will then light for 8s as above and the Red LED will blink with its low-battery warning. This is a self-test and does not mean the battery is flat.</p>	<p><i>When the LED goes out, the unit will be programmed and ready to work in Stand-ard or Multi-Pulse mode as appropriate. You can check the setting by pressing the Restart/Fire button as described above.</i></p> <p>4. Set the Permanent Learning Mode</p> <p>If you do nothing at all in Learn mode the mode will time out after 15 seconds and the unit will be set to a Permanent Learning mode. In this mode, each time the unit is triggered it counts the number of flash pulses received and stores this value to use the next time the unit is triggered. The Green LED will flicker rapidly for 8s to indicate Permanent Learning Mode.</p> <p><i>When the LED goes out, the unit will be programmed and ready to work in Permanent Learning Mode. You can check the setting by pressing the Restart/Fire button as described above.</i></p> <p>5. Clear the Permanent Learning Mode</p> <p>Setting Learn Mode and programming a number of pulses (actions 2 and 3 above) will cancel the Permanent Learning Mode.</p> <p>6. Set the Delayed Fire mode</p> <p>Pressing Restart whilst Mode is held down sets Delayed Fire mode – see additional documentation.</p> <p>7. Calibrate the Low Battery condition</p> <p>This action is not normally required – see additional documentation.</p> <p>Identification</p> <p>Software version slv-4v3 PCB Serial No _____ Software Serial No _____ FS1 fitted? _____ Photodiode SFH (Vis./IR) BPW (IR) Window transparency Visible IR</p> <p style="text-align: right;">  David Gibson, 12 Well House Drive, LEEDS, LS8 4BX david@caves.org.uk, caves.org.uk / flash </p>
<p><i>Allows you to:</i></p> <ol style="list-style-type: none"> 1. Fire the slave unit manually. This is useful if you need to test the connection to your flashgun. The slave unit will fire when the button is released. 2. Restart the operating program. If you get muddled during programming, this button resets the software. The device does not revert to any previous settings. 3. Check the settings. When you release this button, the slave unit fires and the red LED then blinks in a coded pattern to indicate the settings. The green LED then lights for 8s, which is the indication that the unit has fired (see Status LEDs). 4. Set and Clear the Delayed Fire Mode. Pressing Restart clears the Delayed Fire mode. Pressing it whilst Mode is held down sets Delayed Fire mode – see additional documentation. <p>Mode Button</p> <p><i>Allows you to:</i></p> <ol style="list-style-type: none"> 1. Enter Learn Mode. The Mode button is only active when the LEDs are reporting Status information so, if they are both LED lights. Then press Mode to enter Learn Mode, causing the Red LED to light. 2. Program the number of flash pulses. In Learn Mode: Each press of the Mode button will be counted and the unit will use this data for future firings in Run mode. Pause for unit to revert to Run mode after 3s (Red LED will extinguish). 3. Count the pulses from a flashgun. In Learn mode: fire your camera or flashgun. The number of flashes will be counted and the unit will use this data for future firings in Run mode. The unit will stop counting flash pulses 1s after the last pulse has been received. After the unit has counted the pulses the Red LED will blink for 8s to indicate that "flash pulses were received, but the unit did not fire". 	<p><i>When the LED goes out, the unit will be programmed and ready to work in Stand-ard or Multi-Pulse mode as appropriate. You can check the setting by pressing the Restart/Fire button as described above.</i></p> <p>4. Set the Permanent Learning Mode</p> <p>If you do nothing at all in Learn mode the mode will time out after 15 seconds and the unit will be set to a Permanent Learning mode. In this mode, each time the unit is triggered it counts the number of flash pulses received and stores this value to use the next time the unit is triggered. The Green LED will flicker rapidly for 8s to indicate Permanent Learning Mode.</p> <p><i>When the LED goes out, the unit will be programmed and ready to work in Permanent Learning Mode. You can check the setting by pressing the Restart/Fire button as described above.</i></p> <p>5. Clear the Permanent Learning Mode</p> <p>Setting Learn Mode and programming a number of pulses (actions 2 and 3 above) will cancel the Permanent Learning Mode.</p> <p>6. Set the Delayed Fire mode</p> <p>Pressing Restart whilst Mode is held down sets Delayed Fire mode – see additional documentation.</p> <p>7. Calibrate the Low Battery condition</p> <p>This action is not normally required – see additional documentation.</p> <p>Identification</p> <p>Software version slv-4v3 PCB Serial No _____ Software Serial No _____ FS1 fitted? _____ Photodiode SFH (Vis./IR) BPW (IR) Window transparency Visible IR</p> <p style="text-align: right;">  David Gibson, 12 Well House Drive, LEEDS, LS8 4BX david@caves.org.uk, caves.org.uk / flash </p>	

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