S3 Stereoscopic Stepper unit
Reference Guide v2.1
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Introduction
The unit is designed to take the left and right frame of a stereoscopic image for animation or time-lapse applications.

- The unit consists of the following main parts:
  1) The slide providing 74mm of travel (standard unit).
  2) An LCD display to provide status information.
  3) 3 buttons labelled Setup, Yes and No for configuring the unit.
  4) A USB input which is used both to power the unit and also to allow advanced interfacing to computer software and in-field firmware upgrades.
  5) A stereo jack input for triggering the unit from external sources, e.g. motion control, intervalometer, remote control.
  6) A stereo jack output for triggering the shutter on the camera or indicating when the slider is ready for the next frame.

Connections
- The S3 can be used in many different modes and configurations but typically it is connected as follows:
  1) The output jack is connected to the camera to trigger the camera
  2) The input jack is connected to the animation software (e.g. Stop Motion Pro or Dragon software) so the animation software can trigger when to take a frame.
  3) The slider is powered by a power supply connected to the USB/Power port.

Menu & Features
The unit has built in memory to remember any settings. When the unit is switched on it will go straight into shooting mode to carry on from where it was left. Depending on the shooting mode chosen the unit may wait for a trigger or continue in an automated fashion. To change any settings press the SETUP Button. If the unit is waiting for an external trigger, it is possible to manually simulate the next trigger by pressing YES.

The SETUP menu has the following options. (Press YES to select any option, NO to skip to the next option or SETUP to exit the menu back to shooting mode):

- FIND ZERO POINT?
- ADJUST DISTANCE?
- DEMO MODE?
- SET 1 OR 2 FRAME?
- SET INPUT TYPE?
- SET OUTPUT TYPE?
- SET CAMERA DELAY?
- PRE/POST-TRIGGER?
- ADVANCED MOVE?
TIMELAPSE MODE?

SELECT UNITS?

ADJUST SOUND?

SET SCALE?

FIND ZERO POINT?

When the unit is switched on it does not know the position of the slider and one wants the left frame to always be the left most position on the slider.

This option will make the motor move the slider to the left for a length of time sufficient for it to reach the end. Note that this is time based, i.e. if the slide reaches the left hand end early, the motor will continue to push for a few seconds making a grating noise. This is normal.

ADJUST DISTANCE?

This will allow the user to change the distance (called the interocular distance) between the left and right frames. Simply Select YES and then press YES and NO to move the slide left and right to where you want the right frame to be. The distance on the display shows the distance between the left and right frames. Press SETUP when you have finished the adjustment.

DEMO MODE?

For normal shooting, demo mode should be disabled. If enabled, the slide will just move continuously between the left and right frame without waiting for any input triggers.

SET 1 OR 2 FRAME?

In many applications when the unit is triggered it should then move from the left side to the right and then move back to the left ready for the next frame, effectively taking two frames (the left and right – 2 Frame mode) for every single trigger, but sometimes it is required for the unit to move to the right (taking only the left frame) and then wait for another trigger (for the right frame) before moving back to the left. This is 1 Frame mode. This may be because the digital camera is controlled by animation software and it wants to select when the camera trigger should occur. Press YES to change the mode and SETUP when done.

SET INPUT TYPE?

The slider can be triggered from many different devices and events; therefore it is necessary to be able to specify what effect the input will have. For example, when a trigger occurs (a short to ground on the input) generally means the scene is ready and the camera should be triggered to take a frame and then move to the next position. Currently there are no other options and this menu does nothing.

SET OUTPUT TYPE?

The output from the slider can have different meanings. It can be used to trigger the (DSLR) camera to take a frame, or to indicate to some external device that the slider has moved and is ready for the next frame or input trigger. In the case of 1 Frame mode (as above) the two are almost identical, but in 2
frame mode (as described above), one will give an output each time the slider move and the other will give an output only after the slider has finished the left and right eye shots.

The choices in Output type are: TRIGGER CAMERA, LEFT&RIGHT DONE, FRAME DONE.

TRIGGER CAMERA will output each time the camera should take a frame (normally as soon as an input trigger is received before the slide moves to the next frame).

LEFT&RIGHT DONE will output at the end of each completed left and right eye shots.

FRAME DONE will output at the end of the left OR right eye being shot to indicate the unit is ready for the next input trigger. In both the latter two options it is down to the user or some other device to trigger the camera to actually take the frame, rather than the slider unit triggering the camera.

- **SET CAMERA DELAY?**
  A set delay time is allowed for the camera to take its frame before the slider will start moving to the next frame. If this time is not long enough (for example due to long exposure times) then this should be increased. The value given is in seconds and increments in 1/10ths of a second. Press YES or NO to increase or decrease the delay. Hold them down to change them more quickly. The default time is 0.5 seconds.

- **PRE/POST-TRIGGER?**
  This does nothing currently.

- **ADVANCED MOVE?**
  This allows the user to enter in a more complex move such as a varying interocular distance, e.g. a change of 5mm over 100 frames.

- **TIMELAPSE MODE?**
  While many cameras now have their own built in intervalometer allowing simple time-lapse shots to be created (by taking a frame say every set number of minutes or seconds), this mode allows the S3 to keep its own time and create time-lapse shots without a camera that has this facility or a separate intervalometer. If enabled, the unit will trigger not from external events but from its internal clock. The menu allows you to enable or disable the function and if enabled it also allows you to set the number of minutes and seconds per shot.

  *This feature is yet to be implemented. At the moment, the time can be changed but it doesn’t affect the operation of the unit.*

- **SELECT UNITS?**
  When the slide moves its position is always shown on screen. The user can select which units he prefers to see the motion in, millimetres (mm), centimetres (cm), inches ("), or thousandths of an inch (mil). Use the YES and NO buttons to scroll through the list to the preferred one.

- **ADJUST SOUND?**
  Some units have a beeper to give audible indications of button presses or completed frames. This option allows this to be turned on or off.

- **SET SCALE?**
  The scale should not normally need adjusting once set. It determines how much the slide moves each motor turn and this does not change on a unit once manufactured.
Additionally the user should be aware that the S3 Stereoscopic Stepper Unit (S3 or 3D Stepper for short) is provided with a USB port which not only provides power but also allows the firmware inside to be upgraded as new features are added and will also allow control of the unit directly from a PC/Mac using simple serial commands for closer integration with animation software.
Serial Communication (via USB cable)

The unit is capable of interfacing with the PC/MAC through a series of commands over a serial protocol. When the unit is connected to operate in normal mode (as opposed to firmware upgrade mode), it will create a virtual COM Port which then becomes the interface between the S3 Unit and the PC/MAC.

Please use this URL to download the required “.inf” file from the bottom of the page:
http://www.mrmoco.com/Products/StopFrame/S3_3D_Stereoscopic_stepper.htm

Installing the Virtual COM port (Windows):

1. Plug the S3 Unit into an available USB Port.
2. Windows will then detect it as a PBPCDC Communication Port:

![Found New Hardware Wizard](image)

3. Windows will open a Found New Hardware Wizard. Select “No, not this time” and click “Next”:
4. Now Select “Install from a specific location”:

5. Select “Search for the best driver in these locations”, Un-tick “Search removable media” and Tick “Include this location in the search. Click browse and then browse for the folder where the file “pbpcdc.inf” was installed and click “OK”. Click “Next”.

Please use this URL to download the required “.inf” file from the bottom of the page:
http://www.mrmoco.com/Products/StopFrame/S3_3D_Stereoscopic_stepper.htm
6. Select PBPCDC Communications Port 5.1.2600.0 microEngineering Labs, Inc. and click “Next”:

![Found New Hardware Wizard](image1)

7. Click “Continue Anyway”:

![Hardware Installation](image2)

8. Click “Finish” to close the Wizard. Windows will pop up a small balloon at the bottom right corner of the screen informing you that your hardware has been successfully installed.

![Found New Hardware Wizard](image3)
**Serial Communication Protocol**

After successfully installing the Virtual COM port, go to **Control Panel -> System -> Device Manager->Ports (COM&LPT):**

![Image of Control Panel](image1.png)

The “PBPCDC Communications Port (COM XX) should appear in the list, where ‘XX’ is the number assigned by windows to this particular COM port. This number can always be changed by right-clicking on the port name, **Properties->Port Settings->Advanced:**

![Image of Properties](image2.png)

Note the COM port Number as it will be needed for communicating with the device.
**Instruction set for the S3 Serial Communication**

There are two types of instruction sets which are implemented within two different firmware files. The user must load the S3 with the version whose instruction set makes it easier for them to interface with the unit.

**Instruction set 1 (Characters or ASCII version)**

In this mode, commands are sent as a sequence of ASCII CHARACTERS from the PC as follows:

**“T”:** Trigger move. Its behaviour is identical to triggering the unit from the YES button or an external trigger.

**“L”:** Manual GO LEFT. This command will make the slider got to the left position specified from the S3 menu without triggering the camera. **It will only make the slider move to the left position.** This command does nothing if the unit is already in the left position.

**“R”:** Manual GO RIGHT. Same as GO LEFT except that the unit goes to the predefined right position.

**“C”:** Triggers the camera regardless of the position of the slider.

**“S”:** Status Command. When this command is issued, the unit replies back with “L”, “R” or “0”. As the letters suggest, “L” means the unit is in the left position, “R” for the right position, and “0” if it is somewhere in the middle or beyond the maximum specified from the menu. This command can be used in conjunction to other commands as explained later in this manual. (Example: Go left and report status when done).

**“G”:** Manual GO TO Position. This Command allows the user to specify a point for the slider to move to. The format of the command is explained later in this manual.

**“D”:** Manually set the Inter-ocular distance. The format of the command is explained later in this manual.

**“Z”:** Zero the unit. This command moves the slide all the way back to the right and resets the position to zero.

**Command packet format:**

The unit expects to receive a minimum of 1 Byte (1 character) and a maximum of 7 Bytes (7 Characters). The general format of the command goes as follows:

<table>
<thead>
<tr>
<th>COMMAND</th>
<th>STATUS BACK?</th>
<th>POSITION BACK?</th>
<th>X1</th>
<th>X2</th>
<th>X3</th>
<th>X4</th>
</tr>
</thead>
<tbody>
<tr>
<td>COMMAND:</td>
<td>Status back?</td>
<td>Specifies whether to send the status back after the execution of the command, Must be set to “S” to get a status byte back, or “0” otherwise. The default is “0” which means if one only sent 1 letter for the command, this is assumed to be “0”.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
POSITION BACK?: Specifies whether to send the position along with the status byte. It must be set to “P” if needed or “0” otherwise. NOTE that the status has to be set to “S” in order to be able to receive the position too.

X1 X2 X3 X4: Used only with the “G” (GO TO) and “D” (Set Inter-ocular distance) commands, these are 1 byte (1 character) each, and they represent the position in **Millimetres** assuming that there is a decimal point between X1 X2 and X3 X4. Ex: If the position is 34.56, X1 will be character “3” X2 will be character “4” X3 will be character “5” X4 will be character “6”

**NOTE:** One Command should be represented as ONE SEQUENCE of Bytes and sent as an X-byte packet at once. Sending one character at a time will not yield the required results (Like trying to type single characters in a Windows hyper terminal). In this case only commands which are 1-character long will work.

**Practical examples:**

-Trigger unit and send a status packet back:

  TS
  Response:
  R

-Go to the left position and report your status and position back:

  LSP
  Response:
  L4056
  (S3 reports it being at the left position, at 40.56 mm exactly)

-Go to position 54.68 without status or position back:

  G00548

-Go to position 54.68 with status back but no position

  GS05468
  Response:
  0
  (Neither left nor right)

-Go to position 54.68 with status and position back

  GSP5468
  Response:
  05460
  (Neither left nor right, at position 54.60mm)

**Status Packet:**

```
<table>
<thead>
<tr>
<th>“L”, “R” or “0”</th>
<th>X1</th>
<th>X2</th>
<th>X3</th>
<th>X4</th>
</tr>
</thead>
</table>
```
Instruction set 2 (Binary version):
The same fashion is adopted here. The communication is established by issuing a command to the unit and read Status and/or Position if required.

Command packet format:
The Command packet consists of 1 byte (8 bits) followed by a 2-byte position if the command is Go To Position or Set Inter-ocular distance. As previously, these 3 bytes must be sent as one stream of bits and not as separate 1-byte packets. The 2 byte-position consists of 2 hexadecimal numbers (2 x 4bits) whose decimal value is the position in Millimetres, and 2 hexadecimal numbers (2 x 4bits) representing the Hundredths of a millimetre. (See examples below)

Command byte:

<table>
<thead>
<tr>
<th>Bit7 (Status back)</th>
<th>Bit6 (Position Back)</th>
<th>Bit5 ‘x’</th>
<th>Bit4 ‘x’</th>
<th>Bit3</th>
<th>Bit2</th>
<th>Bit1</th>
<th>Bit0</th>
</tr>
</thead>
</table>

‘x’: Don’t care bit, can be either ‘1’ or ‘0’;
Bit7: Set to ‘1’ to receive a status packet back, or ‘0’ otherwise;
Bit6: Set to ‘1’ to receive a position along with the status packet, or ‘0’ otherwise; Note that the status bit has to be ‘1’ in order to be able to receive a position back.

<table>
<thead>
<tr>
<th>Bit 3:0</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000</td>
<td>‘No action’</td>
</tr>
<tr>
<td>0001</td>
<td>Go to the right position, no trigger</td>
</tr>
<tr>
<td>0010</td>
<td>Trigger move (same as pushing YES)</td>
</tr>
<tr>
<td>0011</td>
<td>Trigger the Camera without moving</td>
</tr>
<tr>
<td>0100</td>
<td>Go to the left position, no trigger</td>
</tr>
<tr>
<td>0101</td>
<td>Go to Position specified by the next 2 bytes</td>
</tr>
<tr>
<td>0110</td>
<td>Set the Inter-ocular distance specified by the next 2 bytes</td>
</tr>
<tr>
<td>0111</td>
<td>Send back a Status packet</td>
</tr>
<tr>
<td>1000</td>
<td>Zero the unit</td>
</tr>
</tbody>
</table>

The 2-byte position or Inter-ocular distance, which should be sent along with the command byte, contains 2 groups of 2 hexadecimal numbers representing the position as follows: Hex1Hex2. Hex3Hex4 For example position 42.24mm would be represented by 2A18 where 2A as a hexadecimal equals decimal 42, and 18 as a hexadecimal equals 24.

Status Byte:

<table>
<thead>
<tr>
<th>Bit7 (At Left Position)</th>
<th>Bit6 (At Right Position)</th>
<th>Bit5 ‘0’</th>
<th>Bit4 ‘0’</th>
<th>Bit3 ‘0’</th>
<th>Bit2 ‘0’</th>
<th>Bit1 ‘0’</th>
<th>Bit0 ‘0’</th>
</tr>
</thead>
</table>

Bit7: if ‘1’ means the slide is at the Left position. ‘0’ if it is otherwise.
Bit6: if ‘1’ means the slide is at the Right position. ‘0’ if it is otherwise.
**Practical examples:**
Go to Position 42.24mm and send back your status and position:  
11000101 0010 1010 0001 1000  
*Goto Pos  2  A  1  8*

Response:
00000000 0010 1010 0001 1000

Go to Left send back your status:  
10000100  
Response:
10000000  
(In the left position)
External Connectors and their Pinout

IN:

- External Trigger (Active Low)
- Ground

OUT:

- USB A type
- Mini-USB B type
OUT:

Camera Trigger (Active Low)

Ground
Instructions on upgrading the MRMC S3 Firmware

Please use this link to download the required Re-flash utility and the Firmware SPECIFIC TO YOUR UNIT from the bottom of the page.

http://www.mrmoco.com/Products/StopFrame/S3_3D_Stereoscopic_stepper.htm

1. Double click the file called “S3 Reflash Utility.exe”
2. The application will display: Device not detected…etc
3. Hold the Setup button and Connect the Unit to your PC using an A to Mini USB type lead (The same cable the unit is powered from)
4. The Application should state that the device has been attached. Note that the flashing red and green lights on the unit mean that it is now ready to receive the firmware upgrade.
5. Now click the “Open Hex File” button
6. Browse to where the “xxxxxxxxx.HEX” is installed, Select it and then click “Open”
7. Click “Program/Verify”.
8. Wait for the application to go through the different programming and verification steps until the display looks like:

![MRMC USB Reflash Utility for S3](image)

9. Do not worry about the message “Program/Verify Failure”. The unit should be programmed now.
10. Remove the USB PLUG and then power up the unit.