

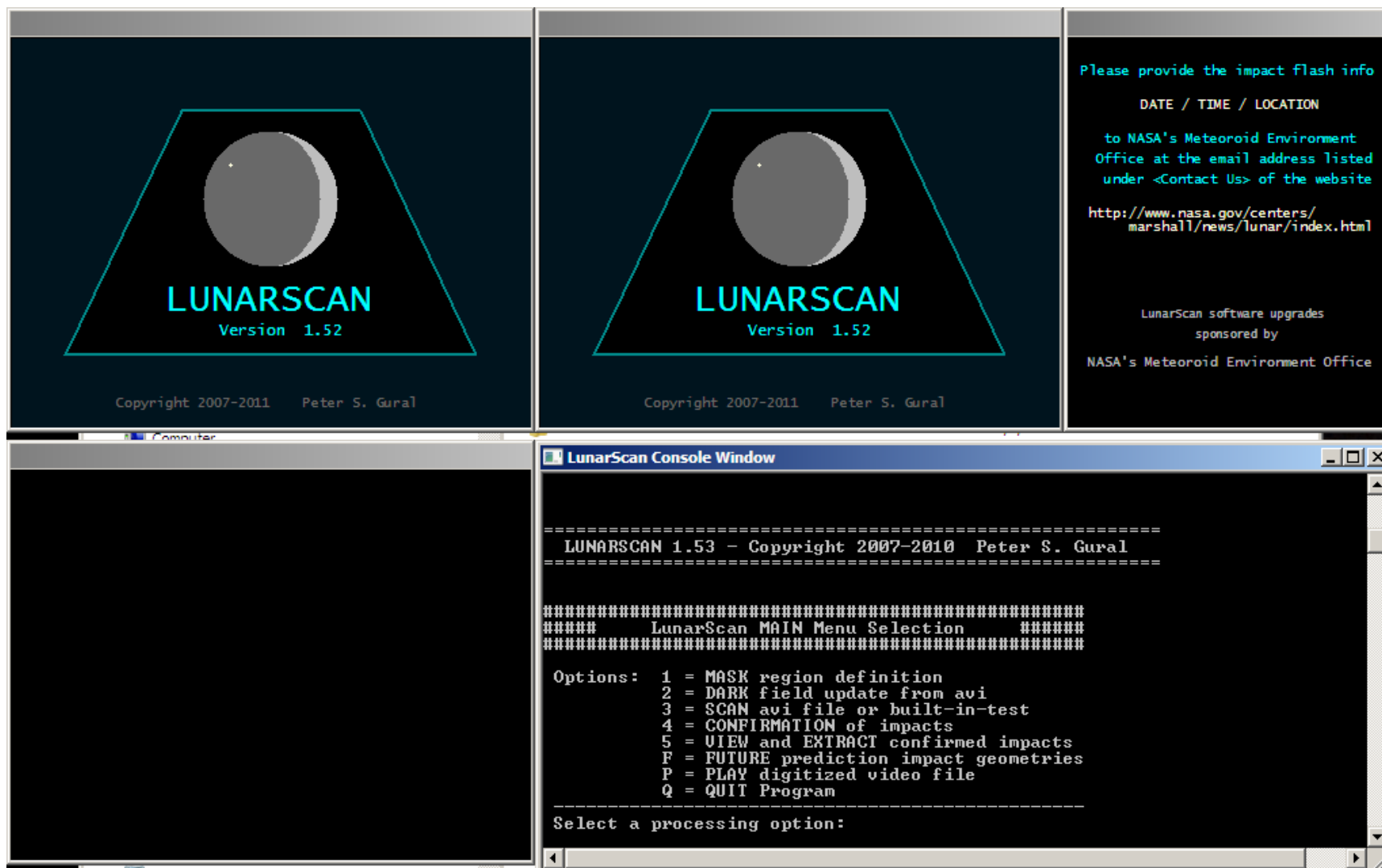
Step 1 MASK region definition

From the Lunarscan main menu, type in 1 (Mask region definition) (enter)

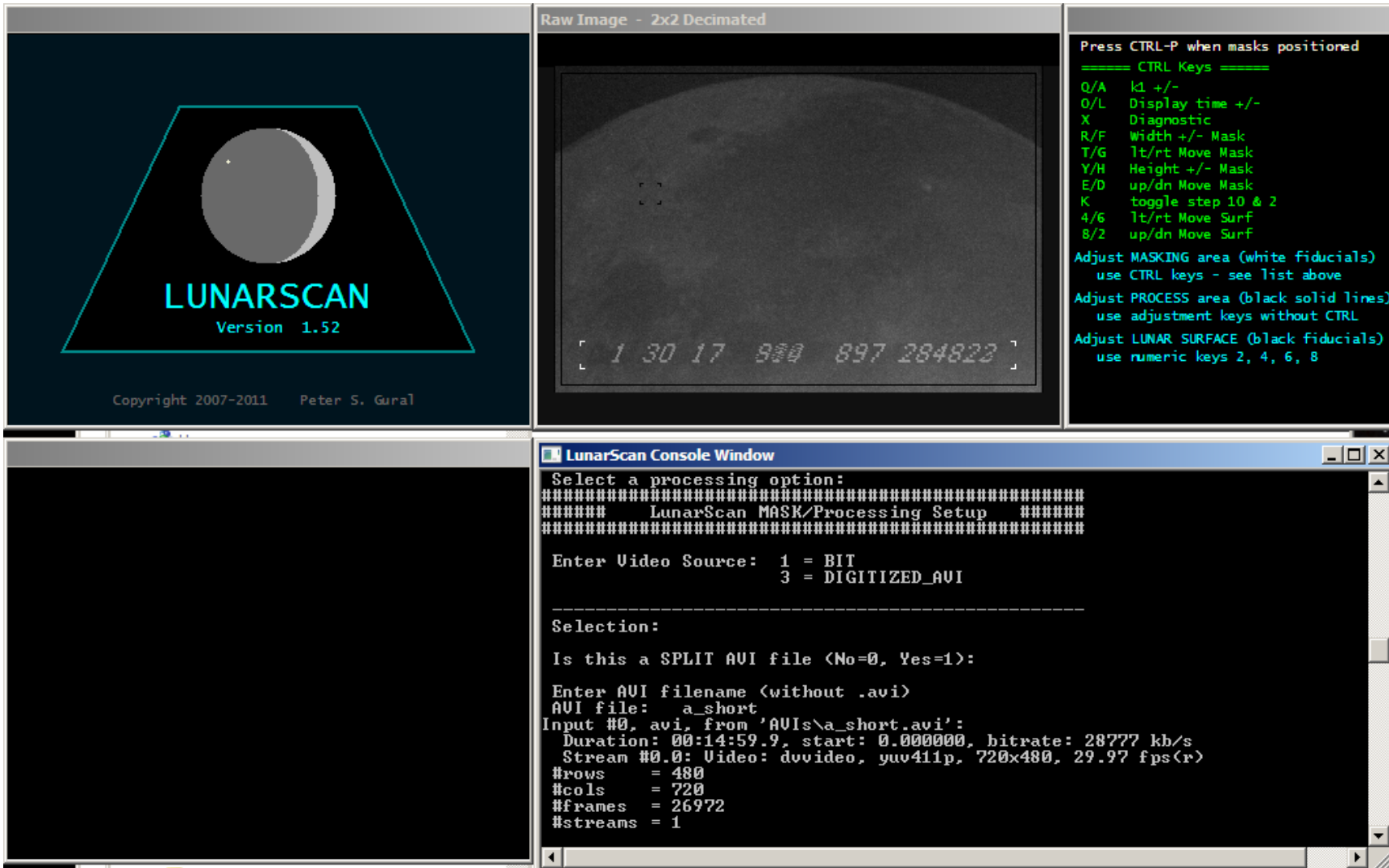
Type 3 for DIGITIZED_AVI (enter)

Type 0 for SPLIT AVI (enter)

Enter AVI filename (without .avi) (enter) see next page



The Mask Region Definition screen, below, is displayed



Mask Region Definition screen

The Processing Area defines the area that should be scanned ONLY. Do not include any illuminated surface. Alter the size and position using the following **Keys: R/F Width +/- T/G move Left, Right Y/H Height +/- E/D move Up, Down**

The Masking Area is used to mask the time stamp. Alter the size and position using the following **Keys: CTRL + R/F Width +/- T/G move Left, Right Y/H Height +/- E/D move Up, Down**

The Lunar Surface (black fiducials) represents the brightness of area to be scanned. This allows the background sky to be omitted from scanning. Place the black fiducials over a portion of the moon that represents the average brightness. **Keys: 2=down 4=left 6=right 8=up** Press CTRL + P when finished to return to the main menu.

The screenshot shows a 'Raw Image - 2x2 Decimated' with three main regions defined by white fiducials:

- Processing Area:** A large rectangular area at the top of the image. A blue arrow points to it with the text 'Processing Area' and 'Keys: R/F T/G Y/H E/D'.
- Masking Area:** A smaller rectangular area at the bottom containing a timestamp '1 30 17 897 284822'. A blue arrow points to it with the text 'Masking Area to mask timestamp' and 'Keys: CTRL + R/F T/G Y/H E/D'.
- Lunar Surface black fiducials:** A small square area in the middle-left of the image. A blue arrow points to it with the text 'Lunar Surface black fiducials' and 'Keys: 2 down, 4 left, 6 right, 8 up'.

On the right side of the screen, there is a list of control keys:

```
Press CTRL-P when masks positioned
===== CTRL Keys =====
Q/A  k1 +/-
O/L  Display time +/-
X    Diagnostic
R/F  Width +/- Mask
T/G  lt/rt Move Mask
Y/H  Height +/- Mask
E/D  up/dn Move Mask
K    toggle step 10 & 2
4/6  lt/rt Move Surf
8/2  up/dn Move Surf

Adjust MASKING area (white fiducials)
use CTRL keys - see list above

Adjust PROCESS area (black solid lines)
use adjustment keys without CTRL

Adjust LUNAR SURFACE (black fiducials)
use numeric keys 2, 4, 6, 8
```

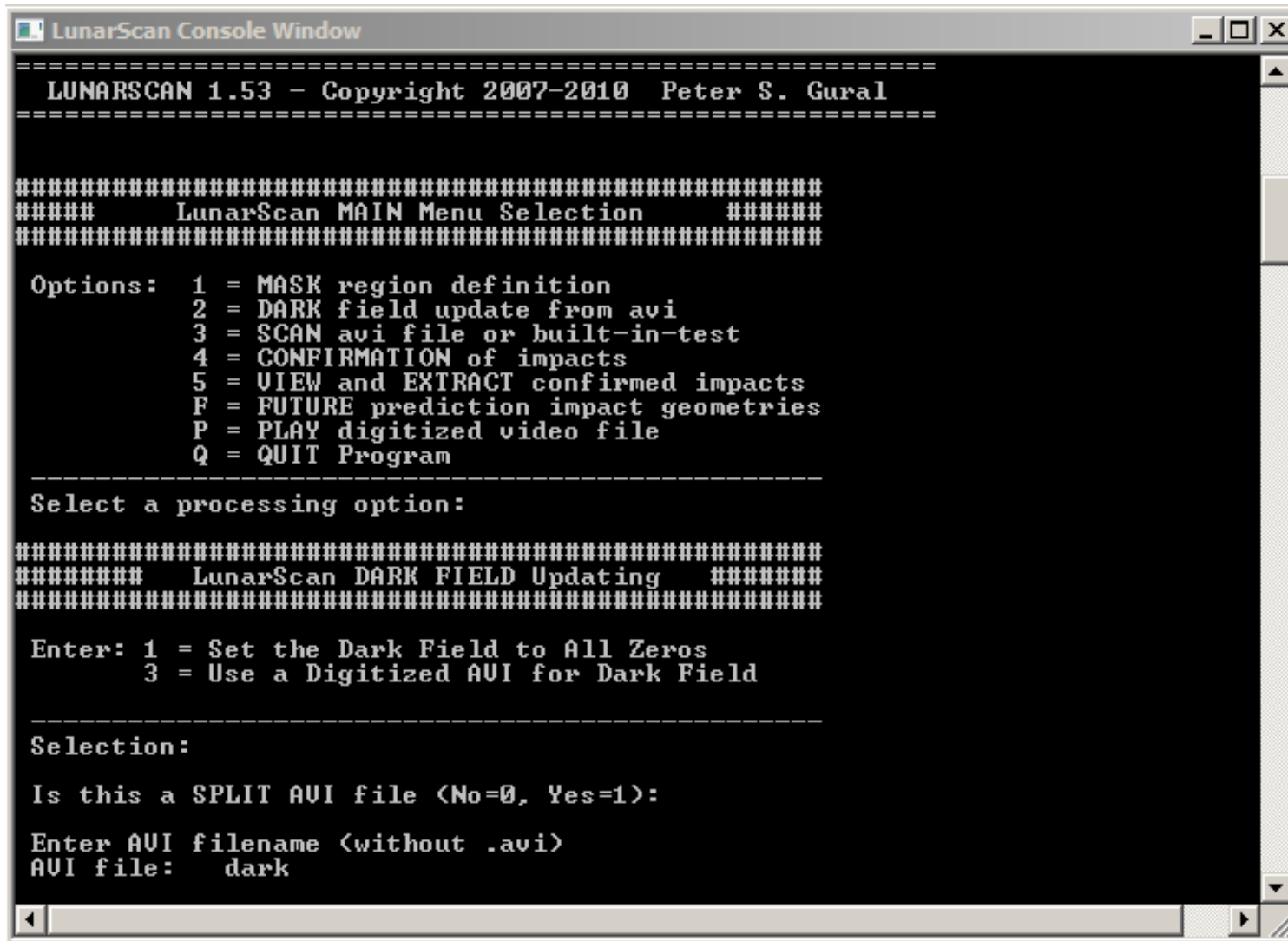
Step 2, read in Dark Frame video

From the main menu, hit the 2 key for DARK field update from avi (enter)

Type in 3 for Use a Digitized AVI for Dark Field (enter) (or type 1 to reset to all zeros)

Type in the name of the dark frame file without the “.avi” extension (enter)

The dark frame video will be processed and the information saved for future use



```
LunarScan Console Window
=====
LUNARSCAN 1.53 - Copyright 2007-2010 Peter S. Gural
=====

#####
##### LunarScan MAIN Menu Selection #####
#####

Options:  1 = MASK region definition
          2 = DARK field update from avi
          3 = SCAN avi file or built-in-test
          4 = CONFIRMATION of impacts
          5 = VIEW and EXTRACT confirmed impacts
          F = FUTURE prediction impact geometries
          P = PLAY digitized video file
          Q = QUIT Program

-----
Select a processing option:

#####
##### LunarScan DARK FIELD Updating #####
#####

Enter:  1 = Set the Dark Field to All Zeros
        3 = Use a Digitized AVI for Dark Field

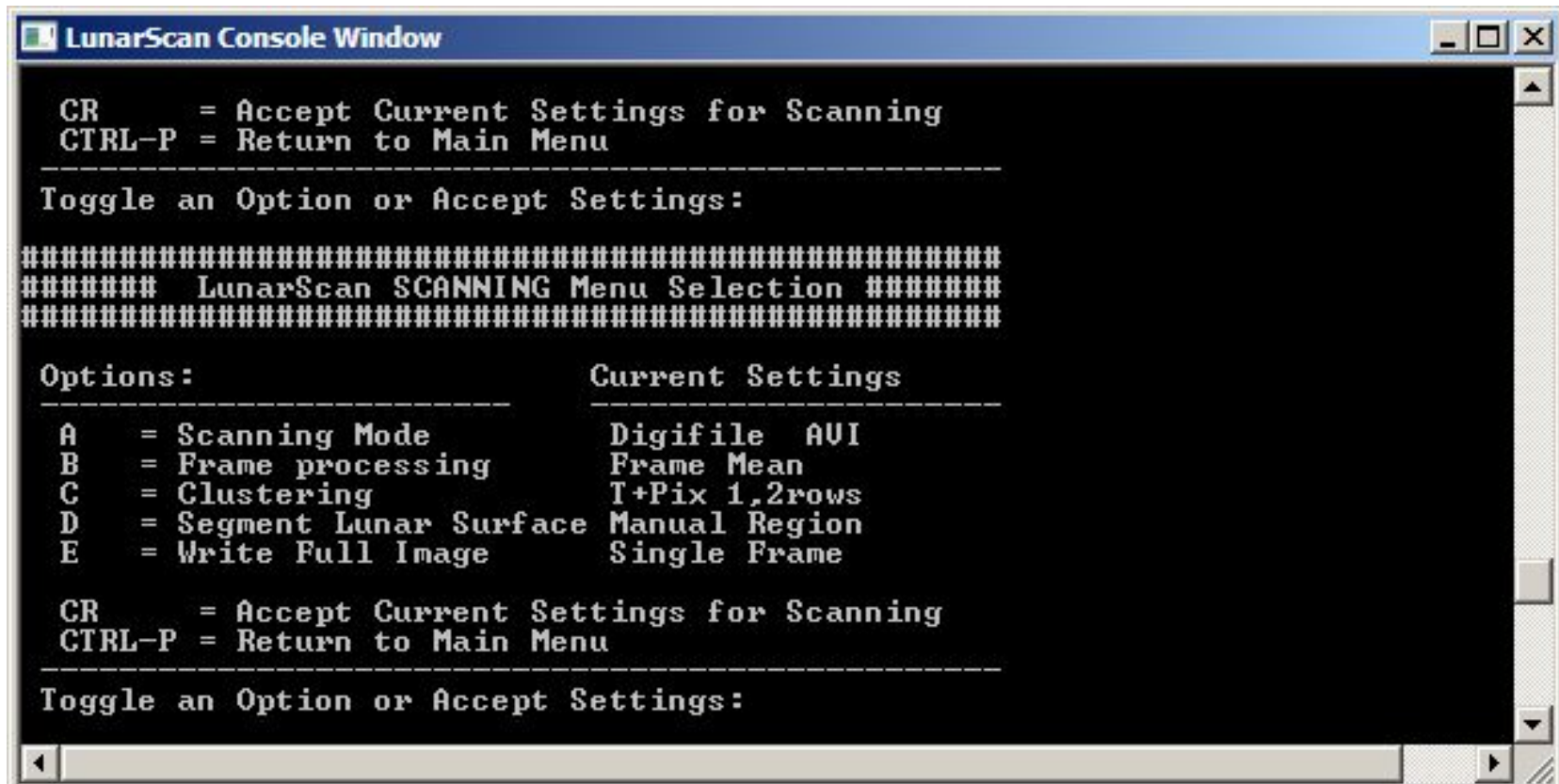
-----
Selection:

Is this a SPLIT AVI file (No=0, Yes=1):

Enter AVI filename (without .avi)
AVI file:  dark
```

Step 3, scan settings / scanning

1. From the main menu, type in 3 (Scan AVI file...) (enter)
You arrive at the screen below
2. Set B = Frame mean – (Register mean is extremely slow)
3. Set C = T+Pix 1,2 rows- (less false detections than Triplets only)
4. Set D = Manual Region – (works better than Auto Histogram)
5. Press Carriage Return/Enter to accept setting
6. Type 0 for SPLIT AVI (enter)
7. Enter AVI filename (without .avi) (enter)
8. Enter output file base name (enter)
9. Enter Header Information (enter)
10. Enter Imagery date and UT (enter)
LunarScan should start scanning



```
LunarScan Console Window

CR      = Accept Current Settings for Scanning
CTRL-P = Return to Main Menu
-----
Toggle an Option or Accept Settings:

#####
##### LunarScan SCANNING Menu Selection #####
#####

Options:                Current Settings
-----                -----
A   = Scanning Mode      Digifile AVI
B   = Frame processing    Frame Mean
C   = Clustering          T+Pix 1,2rows
D   = Segment Lunar Surface Manual Region
E   = Write Full Image    Single Frame

CR      = Accept Current Settings for Scanning
CTRL-P = Return to Main Menu
-----
Toggle an Option or Accept Settings:
```

For additional information on these settings, please refer to the LunarScan manual

Scanning settings explained

Frame Mean should be used if you want faster processing at the expense of more false detections. Register Mean is slower but can run at a lower detection threshold.

For “Segment Lunar Surface”, don’t use the Auto-Histogram setting. It can equate darker portions of the shadowed lunar surface to that of the background sky, occasionally omitting those areas from being scanned.

The “Clustering” setting can be changed to eliminate some cosmic rays. I typically use the Triplets Only setting which is the most sensitive. If the camera in use is noisy, it might be prudent to use the last setting. However, this setting should not be used to stifle random noise problems with the video signal. That should be corrected first by using high quality power adaptors, video cables and connectors.

Triplets Only scans three horizontal adjacent pixels (returns most false detections)

Trips and Pixel 1-2 Rows triplets that have a single pixel one or two rows above or below

Trips and Doubs 2 Rows triplets that have a pair of pixels two rows above or below

Trips and Doubs 1 Row triplets that have a pair of pixels one row above or below

To check if LunarScan is performing correctly during a scan, first set the screen to refresh every second by pressing the CTRL + L keys. Next, use the “1” key to cycle through three different screen views. The third screen in the cycle shows a white moon with a black sky background (left image). Watch this screen for a bit to see if any shadowed portions of the moon turns, or if the background sky displays white pixels for a few instances. In the three images below, the left image is what you want it to look like. The middle right images need to have the Lunar surface black fiducials moved.

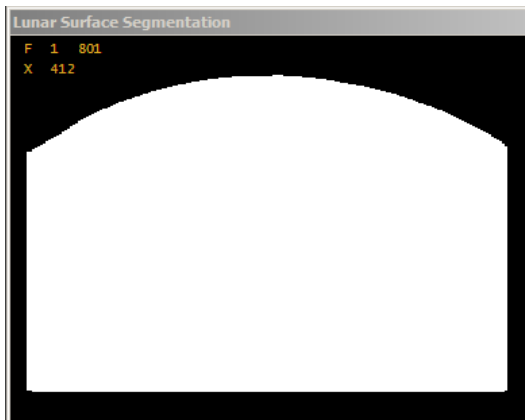
If part of the background sky has illuminated pixels (center image), hit the 1 key to exit the view and move the Lunar Surface black fiducials to a brighter location using the 2,4,6,8 keys. The region it currently resides in is too close to the background sky level.

If part of the shadowed portion of the moon has black pixels (right image), hit the 1 key to exit the view and move the Lunar Surface black fiducials to a darker area. The region it currently resides in is too bright.

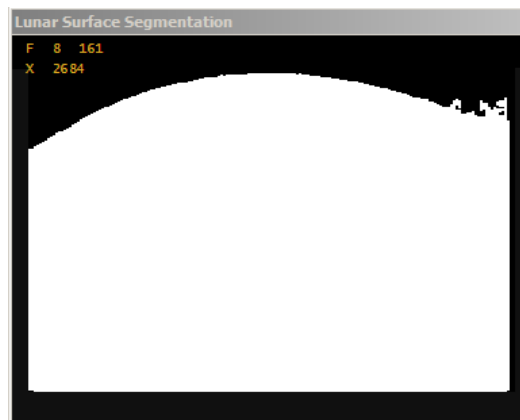
Cycle again through the screens to check if it helped.

Experiment with and learn this process as each imaging session will have a different lunar illumination and background sky brightness and conditions can also change during the session.

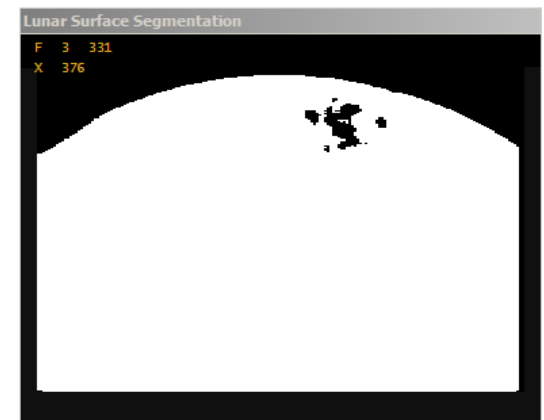
Correct



Too dark



Too light



During a scan, if LunarScan is detecting too many hits for no reason, use the CTRL+Q key to decrease detection sensitivity (K1 primary sigma factor). Use the CTRL+A key to increase sensitivity. Find the point where LunarScan is not generating too many hits. I typically have this value set anywhere from 16 to 20, while using Frame Mean scanning. This setting can cause false detections from hand corrections, improper backlash settings, wind and a turbulent atmosphere. However, expect many false detections as sensitivity is what is needed to find faint impact events. A massive and stable mount, combined with very subtle hand corrections or auto-guiding will return the best results.