

SOP: Synchronization of Fastec Cameras with Other Devices

A. What this SOP covers

In some situations, you need synchronized data from a high-speed video camera and another device, including another camera or a force plate. Our two Fastec cameras can be synced with each other, with the Kistler Type 9260AA force plate, and with the IDT high-speed camera that is installed on the cinefluoroscope. For instructions on use of the force plate or the cinefluoroscope, please get training from Dr. Bergmann and refer to the appropriate SOPs. Use this SOP to synchronize these devices.

B. What you need before you start

- Two Fastec Troubleshooter LE cameras, OR
- One Fastec Troubleshooter LE camera and one Kistler force plate and DAQ, OR
- One Fastec Troubleshooter LE camera and one IDT camera (attached to cinefluoroscope)
- Two BNC cables (coaxial cables with plugs as used for cable TV)
- One pickle switch
- One BNC ‘T’ connector
- One BNC connector for two BNC cables
- One or two Fastec BNC adaptor cables

C. Warning

If you are unsure how use these instruments, please get training from Dr. Bergmann or another student that knows how to use them before doing anything with them. All of this equipment is expensive and delicate in certain situations.

**** **This Procedure Still Needs to Be Tested!** ****

D. Procedure for syncing two Fastec Troubleshooter LE cameras

1. There are two ways to sync two Fastec Troubleshooters
 - a. Both cameras as masters, triggered by a pickle switch.
 - b. One camera as a master, the other as a slave, with the master controlling the slave.
2. Syncing two masters with a pickle switch.
 - a. Connect the cable of the pickle switch to the foot of the ‘T’ connector.
 - b. Connect two Fastec BNC adaptor cables, one to each arm of the ‘T’ connector.
 - i. The adaptor cables have three strands that have BNC plugs on them, labeled “Sync In”, “Sync Out”, and “Trigger”.
 - ii. Connect the strand labeled “Trigger” on each adaptor to the ‘T’ connector.
 - c. Plug the single strand end of each adaptor cable into the correct socket on each of the Fastec cameras.
 - d. Turn on the cameras, access the menus by pressing “XXXX”, and ensure that the settings are correct. Both cameras will have the same settings.
 - i. Set the **Sync Point** to **Master**.
 - ii. Set the **Trigger Point** to the same thing, depending on your needs (often to **End**).
 - iii. Set the **Trigger Marker** to **On**.
 - iv. Set the **Trigger Input** to **Falling Edge**.
 - v. Ensure that the frame rate and shutter speed are the same for both cameras.
 - e. You can trigger both cameras simultaneously by pressing the button on the pickle switch.

3. Syncing two Fastec Cameras, one as master and one as slave.
 - a. Connect the two Fastec adaptor cables to their respective cameras.
 - b. Connect the “Sync Out” strand of the adaptor to the BNC connector for two cables for the camera that will be the master.
 - c. Connect the “Sync In” strand of the adaptor to the BNC connector for two cables for the camera that will be the slave. The two adaptor cables should now be connected via their “Sync In” and “Sync Out” strands.
 - d. Turn on the cameras, access the menus by pressing “XXXX”, and ensure that the settings are correct. The cameras will have some different settings.
 - i. On both cameras, set the **Trigger Point** to the same thing, depending on your needs.
 - ii. On both cameras, set the **Trigger Marker** to **On**.
 - iii. On both cameras, set the **Trigger Input** to **Falling Edge**.
 - iv. On the Master camera, set the **Sync Point** to **Master**.
 - v. On the Slave camera, set the **Sync Point** to **Slave**.
 - vi. Ensure that the frame rate and shutter speed are the same for both cameras.
 - e. You can trigger both cameras simultaneously by using the Master camera as you normally would.

E. Procedure for syncing a Fastec Troubleshooter LE with an IDT camera

1. Because the Fastec and IDT cameras work slightly differently, they need to be synced with the IDT as a Master and the Fastec as a Slave.
2. Connect a BNC cable to the **Sync Out** plug on the IDT camera.
3. Plug the Fastec adaptor cable into the Fastec camera.
4. Attach the adaptor cable’s **Sync In** strand to a BNC connector for two cables.
5. Connect the other side of the BNC connector to the cable attached to the IDT camera.
 - Both cameras should now be connected.
6. Adjust the IDT camera settings on the computer:
 - a. Set the number of frames recorded to 2635, which is the same as the Fastec records.
 - b. Set the trigger to **100% post-trigger**, using the slider bar.
7. Adjust the Fastec camera settings in the camera’s menus:
 - a. Set the **Sync Mode** to **Slave**.
 - b. Set the **Trigger Point** to **End**.
 - c. Set the **Trigger Marker** to **On**.
 - d. Set the **Trigger Input** to **Falling Edge**.
8. The IDT camera software requires a reset of settings after every video. After saving a video from the IDT camera on the computer:
 - a. Click on the **Settings** button – this is the little icon on a gear/sprocket.
 - b. Click on **Delete All...** in the **Advanced Acquisitions Configuration**.
 - c. Reset the number of frames recorded and post-trigger as described in step E.6. before taking another set of synced videos.

F. Procedure for syncing a Fastec Troubleshooter LE with a Kistler force plate

1. A Fastec camera and Kistler force plate are synced both as masters, and triggered by a pickle switch.
2. Cable connections
 - a. Connect a BNC cable to the plug on the Data Acquisition Unit (DAQ) of the force plate that is labeled **Trigger**.
 - b. Connect the other end of the BNC cable to one arm of a BNC 'T' connector.
 - c. Connect the cable from the pickle switch to the foot of the 'T' connector.
 - d. Connect the strand of the Fastec adaptor cable that is labeled **Trigger** to the other arm of the 'T' connector.
 - e. Plug the other end of the adaptor cable into the Fastec camera.
2. Fastec camera settings
 - a. Turn on the camera, access the menus by pressing "XXXX", and ensure that the settings are correct:
 - i. Set the **Trigger Point** to **Start**.????CONFIRM
 - ii. Set the **Trigger Marker** to **On**.
 - iii. Set the **Trigger Input** to **Falling Edge**.
 - iv. Set the **Sync Point** to **Master**.
3. Kistler force plate settings
 - No special settings are needed for the force plate.
4. Coordination of data collection by the camera and force plate.
 - a. It is recommended that the data acquisition settings of the camera and force plate be matched for easier coordinations between force measurements and frames.
 - b. If the camera is set to 250 Hz, it will record an 8 s trial at a resolution of 640 x 480.
 - c. If you set the force plate to collect 8 s worth of data and sample at 2500 Hz, then the length of data collected by each device is the same and one video frame corresponds to ten force measurements.
5. Running a trial with synced camera and force plate
 - a. Press the **Acquire trial** button in the Bioware software controlling the force plate, and press **start**.
 - b. After the force plate is ready, press the button of the pickle switch to start recording data with both the camera and the force plate.