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BULLETIN
BUL-089

Shepherd P4S4 Uomo Operations

This document covers the procedures needed to operate a Pronto4 Series 4 Uomo (P4S4 Uomo) robot, running IVN or VAK software, from an Operator Control Unit (OCU) with the Shepherd application. For a more comprehensive coverage of the Shepherd application, see the Shepherd Overview documentation.

Ongoing Safety Procedures

Ensure all operators have read and understand all related safety documentation, including the Shepherd Overview sub-sections: “Safety Summary” and “Notes, Cautions, and Warnings that apply to all operations”.

Basic Vehicle Checks

The basic vehicle checks should be run at least once per day, prior to all other checks and operations, and prior to moving the vehicle.

1. Verify all vehicle maintenance is current and documented.
2. Verify there are no operational discrepancies, such as damage, vehicle fluids leaking, servicing needs, or maintenance requirements.
3. Verify the vehicle has, at a minimum, sufficient fuel for the day's missions.

Uomo Preparations

1. Manually position and park the robotic vehicle with its wheels straight and steering wheel centered.
2. Manually clean the camera/s with a clean cloth.
3. Ensure the vehicle parking brake is released.
4. Install the Uomo. Refer to the Uomo Quick Reference Guide for specific installation procedures.
5. Ensure the operating area is clear for operations.
6. Verify the safety operator is in the passenger's seat, with seat belt secured, clear of all controls, including the steering wheel, and in a position to activate controls, including the emergency hand brake.
7. If the Key Start Module has NOT been installed, the safety operator manually starts the vehicle engine.

OCU Set-up

The OCU start-up procedure should be performed after the P4S4 Uomo has been started and prior to any operations. Unless otherwise stated, all steps in the OCU set-up are performed by the OCU operator.

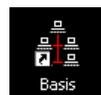
1. Ensure the Tele-op controller is connected properly, as follows:
 - a. Main controller (e.g., Logitech Steering Wheel or Joystick) is connected to an available USB port on the OCU laptop.
 - b. If using a Logitech Steering Wheel, foot pedals are connected to the Steering Wheel controller.
 - c. If using a Logitech Steering Wheel, steering wheel connected to 100-250 VAC, 50-60 Hz wall outlet or power inverter.
2. Ensure the OCU USB E-Stop is connected to an available USB port on the OCU laptop.
3. Ensure OCU switches are in the following states:
 - a. E-Stop is NOT activated (i.e., not depressed). Rotate the red button 1/4 turn clockwise and up to release, and to verify the E-Stop is not depressed.
 - b. ON/OFF switch is in the "ON" position.
 - c. PAUSE/RUN switch is in the "RUN" position. Until the OCU is fully booted, no LEDs should be illuminated.



WARNING

If using a Logitech Steering Wheel, keep hands clear until the OCU is fully booted up. It will automatically rotate twice during OCU boot-up. Failure to keep clear can result in injury.

4. Press the OCU computer power button to turn the OCU on. If the OCU fails to boot within a minute, plug it into an AC outlet. If it still fails to boot, contact Kairos Autonomi.
5. Verify djBasis starts up. If djBasis fails to start, double-click the djBasis icon on the desktop.



6. Verify the appropriate programs start-up, *as follows*:
 - a. If djBasis is not visible, restore it from the taskbar.
 - b. On the “Executable Manager” tab, verify the following “Module Name” entries are listed and their “Status” is listed as “Active”.
 - djBasis.exe
 - djSharedLinkF.exe
 - djEtherMap.exe
 - djShepard.exe

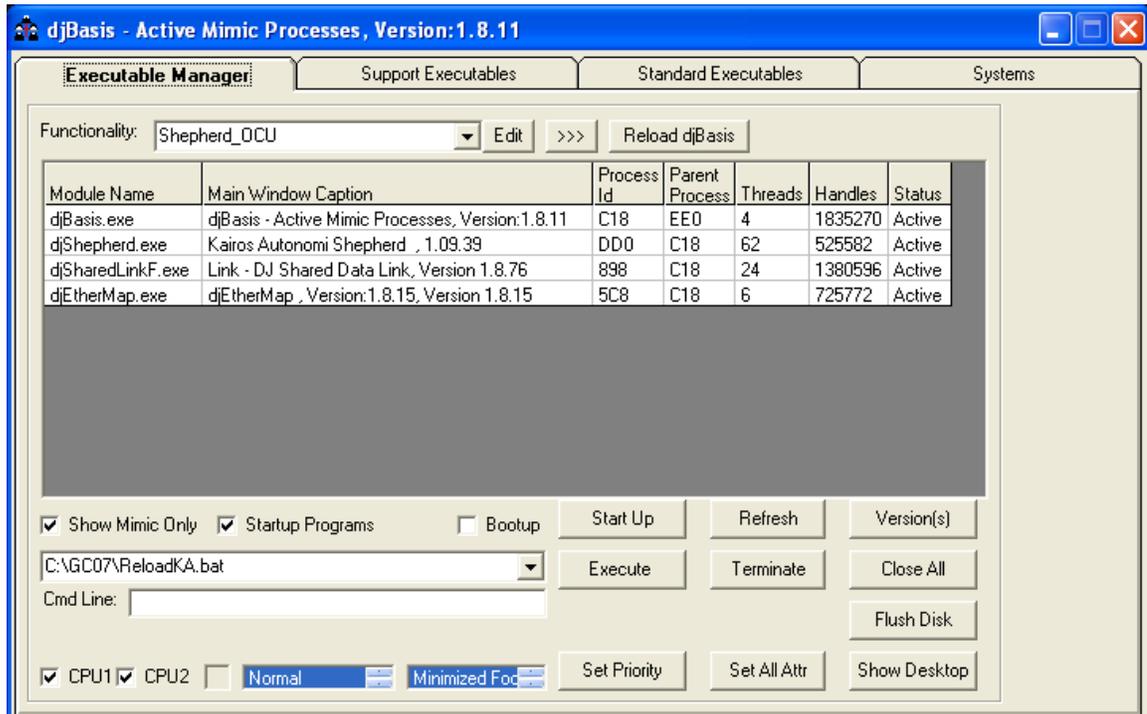


Figure 3: djBasis' Executable Manager tab displaying all appropriate programs with an Active status. Note: Version numbers may differ and additional programs may be listed.

- c. If an entry displays a status other than “Active”:
 - i. Single click on its entry. The entry's program path should be displayed in the drop-down at the bottom of the window.
 - ii. Click the Execute button to the right of the drop-down.
 - iii. Wait approximately 15 seconds. If the entry is still not “Active” contact Kairos Autonomi support.
7. On the OCU USB E-Stop verify the green LED is flashing, which indicates the system is broadcasting, and the red LED is NOT illuminated.

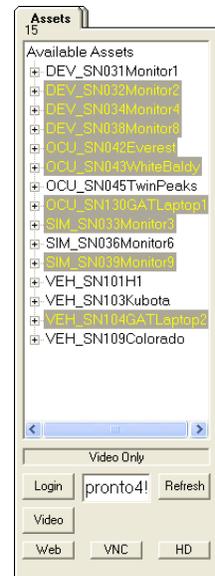
8. If Shepherd is not visible, restore it from the taskbar. Maximize the Shepherd window, with the “Asset View” tab in front.

NOTE

If operating a vehicle without a “Park” gear, the system should be configured to use “Neutral” as Park. In such a case, when Shepherd reports that the vehicle is in either Park or Neutral, the vehicle is in Neutral.

Basic Robotic Control

1. Activate the desired robot, *as follows*:
 - a. In Shepherd's “Asset” tab area, click on the robot's name (e.g., VEH_SN001H1).
 - b. Click Login.
 - c. In Shepherd's “P4S4” tab area, verify that the robot's name appears at the top and that the “Link Quality” count is increasing and does not have a red background.
2. Activate robot’s video, *as follows*:
 - a. On Shepherd’s “Video” sub-tab, click in the lower-left drop-down and type in “192.168.200.161”.
 - b. To the right of the video IP drop-down, click the Stop button (i.e. black square).
 - c. Between the video IP drop-down and the Stop button, click the Play button (i.e. black triangle pointing to the right).
 - d. Verify there is video. Note that it may take up to 60 seconds to see video.
3. Set view tabs as desired. See the Shepherd Overview documentation, particularly the “View Tabs” section, for more detail.



The robot is ready to be tele-operated.



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Robotic Operations

Tele-Operations

CAUTION

If any E-Stop switch (i.e. VIM, OCU, or an external E-Stop) is engaged, release all tele-op controller controls, including the Deadman, prior to releasing the E-Stop. Failure to do so can result in erratic robotic response.

1. Verify the safety operator is in the passenger's seat, with seat belt secured, clear of all controls, including the steering wheel, and in a position to activate controls, including the emergency brake pedal.
2. In Shepherd, on the "Teleop/Remote" tab, click the "Teleop On" button.
3. Verify the vehicle engine is running and the transmission is in Park (or Neutral, if applicable). If the engine is not running and the Key Start Module has been installed, in Shepherd, on the "Tele-Op/Remote" tab, click the "Engine Start" button. If the engine is not running and the Key Start Module has NOT been installed, the safety driver should manually start the engine.
4. Unless otherwise specified, the buttons on the "P4S4" tab should be used to shift the vehicle, all other operations should use the tele-op controller (see the document "Reference for Tele-op Controller Functions") to verify each function, *as follows*:
 - a. Press and hold one of the 'Deadman' buttons until directed otherwise.
 - On the "Teleop/Remote" tab, in the Joystick/Gamepad Input area, verify the "Brake" gauge is at 0.
 - On the "P4S4" tab, verify the "Brake" gauge and percentage values are 0.

CAUTION

The vehicle engine is running and throttle is being applied. Apply the Tele-Op Controller throttle slowly and with the minimal force necessary to verify an increase in RPM. Failure to do so can cause engine damage.

- b. Slightly apply throttle.
 - On the "Teleop/Remote" tab, in the Joystick/Gamepad Input area, verify the "Throttle" gauge corresponds to stick movement.
 - On the "P4S4" tab, verify the "Throttle" gauge and percentage values correspond to stick movement.
 - In the vehicle, verify throttle movement corresponds to stick movement.

- c. Slightly apply brake.
 - On the “Teleop/Remote” tab, in the Joystick/Gamepad Input area, verify the “Brake” gauge corresponds to stick movement.
 - On the “P4S4” tab, verify the “Brake” gauge and percentage values correspond to stick movement.
 - In the vehicle, verify brake movement corresponds to stick movement.
- d. Alternate steering left and right.
 - On the “Teleop/Remote” tab, in the Joystick/Gamepad Input area, verify the “Steering” gauge corresponds to stick movement.
 - On the “P4S4”tab, verify the “Steering” gauge and percentage values correspond to stick movement.
 - In the vehicle, verify steering wheel movement corresponds to stick movement.
- e. If the Key Start Module has been installed, press the 'Engine Stop' button.
 - On the “Teleop/Remote” tab, in the Engine area, verify the “Enabled” button indicator is NOT highlighted.
 - On the “P4S4”tab, verify the RPM gauge/indicator shows 0 RPM.
 - In the vehicle, verify the engine stopped.
- f. If the Key Start Module has been installed, press the 'Engine Start' button.
 - On the “Teleop/Remote” tab, in the Engine area, verify the “Enabled” & “Start” button indicators are highlighted.
 - Verify the “Teleop On” button indicator highlights.
 - On the “P4S4”tab, verify the RPM gauge/indicator shows > 100 RPM.
 - In the vehicle, verify the engine started.
- g. Until otherwise directed, use the controller to apply fully apply brakes.
- h. Click the ‘Rev’ button once.
 - On the “P4S4”tab, verify the “Rev” button indicator is highlighted.
 - Verify the vehicle shifted to Reverse.
- i. Click the ‘Neu’ button once.
 - On the “P4S4”tab, verify the “Neu” button indicator is highlighted.
 - Verify the vehicle shifted to Neutral.
- j. Click the ‘Drv’ button once.
 - On the “P4S4”tab, verify the “Drv” button indicator is highlighted.
 - Verify the vehicle shifted to Drive.
- k. Click the ‘Neu’ button once.
 - On the “P4S4”tab, verify the “Neu” button indicator is highlighted.
 - Verify the vehicle shifted to Neutral.



- l. Click the 'Rev' button once.
 - On the "P4S4" tab, verify the "Rev" button indicator is highlighted.
 - Verify the vehicle shifted to Reverse.
- m. Click the 'Park' button once.
 - On the "P4S4" tab, verify the "Park" button indicator is highlighted.
 - Verify the vehicle shifted to Park (or Neutral, if applicable).
- n. Click the 'Drv' button once.
 - On the "P4S4" tab, verify the "Drv" button indicator is highlighted.
 - Verify the vehicle shifted to Drive.
 - Verify the vehicle shifted to Park (or Neutral, if applicable).

NOTE

In the Kairos Autonomi software package, there is an option to change the default Deadman button actions. This includes the option to NOT shift to Park when the Deadman is released. If this option is changed, a note should be made indicating the "Verify the vehicle shifted to Park." is not applicable for the local deployment. If there is a need to change the default Deadman button actions, contact Kairos.

- o. Release the controller's brake and Deadman button.
 - On the "P4S4" tab, verify the "Brake" gauge and percentage go to "100".
 - In the vehicle, verify the brake is fully engaged.
 - On the "P4S4" tab, verify the "Park" button indicator is highlighted.
5. If driving a live mission, the Safety Operator safely exits the vehicle, *as follows*:
 - a. In Shepherd the OCU operator ensures:
 - i. The vehicle is in Park.
 - ii. The "Teleop On" button is NOT illuminated.
 - b. The Safety Operator exits the vehicle and moves to a safe location.
 - c. In Shepherd the OCU operator clicks the "Teleop On" button.
6. Drive the vehicle, as desired. Follow the progress and status of the vehicle in Shepherd.
7. Upon completion of Full Tele-Op, bring the vehicle to a complete, controlled stop by releasing steering and accelerator, then slowly and completely engage the brake.
8. When the vehicle is completely stopped the OCU operator secures the vehicle, *as follows*:
 - a. In Shepherd on the "P4S4" tab, click the "Park" button.
 - b. In Shepherd on the "P4S4" tab, ensure the vehicle shifts to "Park".
 - c. On the Tele-Op Controller, release the Brake.
 - d. On the Tele-Op Controller, release the Deadman.



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- e. If the Key Start Module has been installed, in Shepherd, click the “Engine Stop” button. If the Key Start Module has NOT been installed, the safety operator manually turns off the engine.
 - f. In Shepherd, in the “Teleop/Remote” tab, click the “Tele-op Off” button. The “Tele-op On” button should return to non-highlighted state (i.e. disabled).
9. If this completes operations for the day, proceed to the Operation Termination section of this document.

Operation Termination

At the end of operations the vehicle shall be secured and stowed.

1. When the vehicle is completely stopped the OCU operator secures the vehicle, *as follows*:
 - a. In Shepherd on the “P4S4” tab, ensure the vehicle is in “Park” with brakes at 100%.
 - b. In Shepherd on the “Tele-Op/Remote” tab or via the safety operator, ensure the engine is off.
 - c. In Shepherd, on the “Teleop/Remote” tab, ensure Tele-op is off. The “Tele-op On” button should be in a non-highlighted state (i.e. disabled).
 - d. Restore the “djBasis” application. On the “Support Executables” tab, click the “Kill SV” button. (This will close all OCU applications.)
 - e. Turn off the OCU.
2. When control of the vehicle has been relinquished by the OCU operator, the Uomo may be removed from the vehicle.