

CamBot Studio Site Requirements

A Ross Robotics system consists of control room equipment and studio equipment.

This document specifies site requirements for CamBot studio equipment. It includes the following sections:

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Ask Us Anything — Ross Video is pleased to provide guidance and answer any questions you might have about planning your installation. Our friendly, experienced Program Managers can help you achieve an efficient and trouble-free installation.

IMPORTANT: Ross Robotics always strives to provide excellent customer service. Installation of equipment provided by Ross Robotics must be performed by Ross-qualified personnel only. If any unqualified persons unpack and/or attempt to install equipment provided by Ross Robotics, the warranty is voided, and any actions required to correct the installation and/or repair the equipment will be at the expense of the customer and/or systems integrator.

For More Information about...

- Studio site requirements for Furio robots, see ***Furio Studio Site Requirements (5100DR-023-xx)***.
- How to achieve optimal results when using robotic CamBot XY pedestals for moving on air shots, see ***CamBot XY Pedestals and Moving On Air Shots (5100DR-821-xx)***.
- Control room site requirements for Ross Robotics systems that use a Standard SmartShell Control Station, which features separate computers for SmartShell and the Robotics Server, see ***Control Room Site Requirements for Standard Control Station (5100DR-021-xx)***.
- Control room site requirements for Ross Robotics systems that use a Standalone SmartShell Control Station with Integrated Server, see ***Control Room Site Requirements for Standalone Control Station with Integrated Server (5100DR-032-xx)***.

About Ross Robotics Systems

Robots in the studio are controlled from the control room through a computer application named SmartShell and the SmartShell Joystick Panel. The SmartShell computer communicates with robots and other components over a dedicated Ethernet network.

A single Ross Robotics system can include a variety of CamBot and Furio robots, all controllable from a single operator position. Some systems include multiple operator positions, each with its own SmartShell computer and SmartShell Joystick Panel.

The system can also control selected third-party robots. For more information, contact Ross Video.

CamBot Robot Packages

Every CamBot robotic camera system includes a CamBot pan-tilt head (520PT, 600PT, or 700PT). The head is mounted in one of the following ways:

- Standalone on a fixed column, tripod, wall bracket, or lighting grid pipe (inverted).
- On a free-roaming XY pedestal with robotic lift.
- On a BlackBird C-Series manual pedestal with robotic lift.

CamBot PT Head Packages (head only)

CamBot pan/tilt head packages are as follows:

- **CAM-520PT-PKG** — CamBot 520PT pan/tilt head for payloads up to 30kg (70 lbs). The offset tilt axis design offers a greater tilt range than other heads.
- **CAM-600PT-PKG** — CamBot 600PT pan/tilt head for payloads up to 57kg (125 lbs).
- **CAM-700PT-PKG** — CamBot 700PT pan/tilt head for payloads up to 90kg (200 lbs).

CamBot XY Pedestal Packages (head, robotic lift, and robotic XY pedestal)

CamBot XY pedestal packages are as follows:

- **CAM-600XY-S2-PKG** — Free-roaming robotic XY pedestal with S2 two-stage robotic lift and CamBot 600PT pan/tilt head. The lift stroke is approximately 50cm (19.5"). The maximum payload is 57kg (125 lbs).
- **CAM-600XY-S3-PKG** — Free-roaming robotic XY pedestal with Furio SE three-stage robotic lift and CamBot 600PT pan/tilt head. The lift stroke is 76cm (30"). The maximum payload is 57kg (125 lbs).
- **CAM-700XY-PKG** — Free-roaming robotic XY pedestal with Furio SE three-stage robotic lift and CamBot 700PT pan/tilt head. The lift stroke is 76cm (30"). The maximum payload is 90kg (200 lbs).

CamBot Manual Pedestal Packages (head, robotic lift, and manual pedestal)

The CamBot manual pedestal package is as follows:

- **CAM-600PTL-C2-PKG** — BlackBird C-Series manual pedestal with C2 two-stage robotic lift and CamBot 600PT pan/tilt head. The lift stroke is 50.8cm (20"). The maximum payload is 57kg (125 lbs).
The BlackBird pedestal features three smooth-rolling dual locking casters with integrated cable guards. It features a broad, ultra-stable base with unique anti-tip features, and can still roll through openings as narrow as 81.3cm (32"). Special alignment features in the base enable the BlackBird pedestal to be accurately repositioned around the studio floor.

CamBot Accessories

The CamBot product line features a wide range of optional accessories, including the following:

- **Spare Parts Kits** — You can order spare parts kits to have readily available in case quick repairs are required.
- **Universal Ceiling Mount** — This mount (CAM-UNI-CLM) clamps onto a section of lighting grid pipe, and is suitable for inverted mounting of the CamBot 520PT or CamBot 600PT head. The mount is designed to accept nominal 1.5" Schedule 40 pipe, which has an outside diameter of 1.9" (48mm). The pipe outside diameter must be minimum 48mm (1.9"), maximum 51mm (2").
The mount can be attached to a single pipe, or to two pipes of a section of lighting truss. If mounted to a single pipe, the pipe must be well secured to prevent pipe rotation and other movement. If spanning two pipes of a lighting truss, the two pipes must be no more than 36cm (14.15") apart, center to center. The pipe or truss must be capable of supporting the weight of the robot, payload, and cables (plus appropriate safety factor).
- **Tripods and Pedestals** — Ross Video sells a variety of Cartoni tripods and pedestals suitable for mounting our robotic pan/tilt heads. We also sell mounting adapters, such as the CAM-525-PM8, which is a 20cm (8") pedestal/adaptor that enables you to mount the 520PT head upright, or to a tripod or pedestal.
- **Mitchell Mount Adapter** — The Mitchell mount adapter is suitable for mounting any of our robotic pan/tilt heads to tripods and pedestals with Mitchell mounts. Note: For the 520PT head, a PM8 mounting adapter is also required.
- **Mounting Plates with Pan Bars** — These mounting plates either mount to or replace camera cradles on your robotic heads, enabling you to pan and tilt the camera manually when local control is engaged.
- **CueScript™ Prompters** — Ross Video sells CueScript™ teleprompters that are fully compatible with our robots.
Note: The preceding list does not include all available accessories, and Ross Video continues to develop new ones. Contact us for details about our latest innovations.

Payload Design

It is important to plan exactly what components will be installed on the robot(s), and how they will be secured.

For best results, ensure that:

- The payload is as light as possible. Lighter payloads result in smoother movement, especially when using a dolly. When determining the weight of the payload, remember to account for the weight of all cables that run to the head.
- The payload is as compact as possible and its weight is concentrated near its center. The payload must be balanced in two axes; front to back along the camera cradle, and vertically around the tilt axis.
- The prompter and talent monitor, if used, are light and small. They must be mounted rigidly to prevent unwanted movement of the robotic head. They must have no loose or free-moving parts.

General Studio Requirements

Robotics equipment must be installed in a suitable physical environment:

- Equipment must be installed in an indoor location not exposed to moisture.
- Acceptable air temperature range is 5°C to 40°C (41°F to 104°F).
- Acceptable air humidity range is 0% to 90% RH, non-condensing.
- For systems that include a BlackBird S-Series manual pedestal, the studio floor must be free of ramps and sudden changes in floor height. The pedestal is fitted with anti-tip outriggers for increased stability and these may catch the floor if you are moving over an uneven surface. This problem can often be avoided by rotating the pedestal and moving over the feature in a different orientation. The clearance height of the outriggers on a flat surface is approximately 3/8" (10mm).

Note: Ross Video does not provide Ethernet cables, power supply cables, sync reference cables, or video cables. Such cables are selected or custom-made to suit the facility, and are to be provided by the systems integrator or the customer.

Studio Floor Requirements

Smooth on-air pedestal movements (a.k.a. "trucking" or "dolly" shots) are possible using CamBot XY pedestals under the right conditions. To achieve these optimal conditions there are several things to consider, each of which impacts the quality of the shot.

Technical Set Up

The following are key technical requirements that will ensure the best possible results when using CamBot XY pedestals for on-air pedestal motion shots:

- **A flat, smooth, and clean studio floor**

The studio floor's condition is critical to achieve fluid, stable on-air trucking shots. Because the pedestal is riding directly across the floor, any irregularities in the floor are likely to travel up to the camera and appear in the image as camera shake.

There are **five key factors** to consider when it comes to the impact of floor conditions on image stability:

1. Roughness — Short scale bumps, seams, or discontinuities in the floor that cause the base of the pedestal to bounce sharply up and down as it travels over them. Some examples of floor roughness include:

- › Lips at the seams between tiles, where the edge of one tile is higher than that of the neighboring tile
- › Seams or cracks in concrete floors
- › Texture in a floor tile or on the surface of

- › Dried paint drips
- › Position marks using tape on the floor

WARNING: A discontinuity as small as 0.2 mm (0.008 in) is enough to cause a noticeable bump in the camera image.

2. Compliance or hardness of the flooring material used to provide the top surface of the studio floor — Vinyl flooring is available in tiles or in large rolls for covering larger areas. These are attractive to set designers due to the flexibility they offer in creating different looks or patterns in the floor. Unfortunately, depending on the relative softness of the material, they can compress under the weight of the pedestal when the pedestal is left in place for even an hour or two. This can leave impressions in the floor where the wheels were sitting, which can then cause vibrations in the camera's image if a pedestal crosses over them. Note that in most cases these indentations are temporary and over time will disappear.

3. Flatness of the floor — Unevenness in the floor's surface that varies on the scale of a meter or less. Examples of this include:

- › A hand-troweled, lightly polished concrete floor.
- › A tile floor that has been laid on an uneven subfloor, or with poorly controlled adhesive.

In this case, the determining factor will be the worst-case local gradient across the floor. As the pedestal rolls over the uneven floor surface, not only does each wheel travel up and down, but they are doing so asynchronously (assuming a random unevenness across the floor). As one wheel goes up, the opposite wheel may be going down, and vice versa. As a result, the camera could be moving up and down, as well as swaying side to side. As the maximum height of the pedestal is more than double the wheelbase of the pedestal (i.e. the separation between the two drive wheels), any unevenness between the wheels will be amplified by the time it reaches the camera.

How noticeable this movement is will depend on the speed at which the pedestal is traveling and the height of the camera. To ensure that moderately fast floor moves (15-20 cm/s) can be achieved, one should ensure that the worst-case slope on any part of the floor is less than 2 mm per meter, or a 0.2% incline.

4. Rigidity of the floor or subfloor — Any flex in the floor as the robot travels across it will result in a noteworthy unevenness. This generally only happens when the studio floor is raised, and either the top surface or the underlying support structure is flexing under the weight of the robot.

5. Cleanliness — Any dirt, debris, even dust, can create problems with camera stability in the following ways:

- › The accumulation of dirt or dust on the wheels of the pedestal will cause bumps or wobbles in the motion of the robot.
- › Debris on the floor or stuck to the wheels will cause a sudden bump up and down as it passes under the robot.

To produce smooth, wobble and vibration-free moving shots, we recommend the following approaches when preparing the studio floor:

- A smooth, polished concrete floor without seams. Any cracks should be filled prior to polishing.
- If the floor is concrete but not smooth enough, it should be covered with epoxy to obtain a smooth, flat and seamless surface
- If the subfloor is a raised floor, then:
 - › A solid flat base should first be formed by covering the subfloor with two layers of 3/4 in plywood which should be glued and screwed together. Screw holes and joints should be filled and smoothed.
 - › The plywood should be prepared by sanding and then sealing with a penetrating (solvent free) epoxy priming coat.

To maintain optimal performance, it is important to adhere to the following operational and maintenance practices:

- a. The studio floor should be kept clean by regular scrubbing to avoid dirt and grease contacting the CamBot wheels.
- b. Avoid using spike or masking tape on the floor as this will cause noticeable bumps and vibrations in the camera movements, and potentially leave a residue on the floor and CamBot wheels.
- c. Regularly inspect and clean the CamBot wheels. Refer to the **CamBot XY Pedestals Technical Manual 5100DR-042-xx** for more detailed instructions.

- **Rigid camera, prompter, and accessory mounts**

A loosely mounted or poorly designed rig will cause vibration and resonance that translates into the shot.

- **Properly balanced payload**

A properly balanced payload is essential to achieving smooth on-air shots for all types of moves, including pedestal movements. An improperly balanced payload can also cause accelerated wear and tear on the system.

- **Optimized struts for the payload**

The correct strength of pneumatic strut is required to offset the weight of the camera payload. Therefore, it is essential to determine as accurately as possible the total payload, ex: the total weight of the camera, prompter, accessory equipment, and counterweights before the system is delivered.

Ross Video provides the appropriate strut(s) for your payload, based on information provided at the time of the order. If the payload has changed since the original commissioning, it is important to confirm that the struts are still appropriate for the new payload.

- **Optimized torsion springs for the payload**

Torsion springs in the pedestal base are factory installed but can be changed during commissioning if necessary. Torsion spring tension is selected based on the payload, to achieve optimum performance (less sway) on dolly shots. It should be noted, however, that increasing spring tension to reduce sway may affect pedestal tracking accuracy.

CamBot Studio Requirements

The following table lists studio requirements for CamBot robots:

CamBot Robot System	Studio Requirements
<p>CAM-520PT-PKG</p> <ul style="list-style-type: none"> • CamBot 520PT head <p>or</p> <p>CAM-600PT-PKG</p> <ul style="list-style-type: none"> • CamBot 600PT head <p>or</p> <p>CAM-700PT-PKG</p> <ul style="list-style-type: none"> • CamBot 600PT head 	<p>IMPORTANT: All cables that run to a robot or to a robotic head must contain stranded conductors only. Solid conductors are not acceptable because they are more likely to deteriorate due to robotic movement, causing intermittent data transmission. It is also important to use very light, flexible cables to reduce drag.</p> <p>Studio requirements are as follows:</p> <ul style="list-style-type: none"> • One AC power supply socket per head. Each head comes with a 1.8m (6') AC line cord with a suitable male plug for the country where the system is to be installed. Each head comes with a power supply unit that accepts voltages between 100VAC and 240VAC. Total power consumption per head is as follows: <ul style="list-style-type: none"> • CamBot 520PT — 120 Watts (maximum) • CamBot 600PT — 120 Watts (maximum) • CamBot 700PT — 280 Watts (maximum) • The power supply circuit must be protected by a 15A fuse or circuit breaker (for 120VAC circuits), or an 8A fuse or circuit breaker (for 240VAC circuits). • One Ethernet connection per head. The Ethernet cable must be stranded CAT5E, and the end that plugs into the head must terminate in a male RJ45 connector. The maximum cable distance between the head and the dedicated Ethernet network switch in the control room is 100m (328'). This range can be increased using an Ethernet extender (not provided). • Camera and accessory cables as required, including video output cables, prompter video cables, etc.

CamBot Robot System	Studio Requirements
<p>CAM-600PTL-C2-PKG</p> <ul style="list-style-type: none"> • CamBot 600PT head • C2 two-stage robotic lift • BlackBird C-Series manual pedestal 	<p>IMPORTANT: All cables that run to a robot or to a robotic head must contain stranded conductors only. Solid conductors are not acceptable because they are more likely to deteriorate due to robotic movement, causing intermittent data transmission. It is also important to use very light, flexible cables to reduce drag.</p> <p>Studio requirements are as follows:</p> <ul style="list-style-type: none"> • One AC power supply cable per robot, long enough to allow repositioning of the pedestal. <p>The robot end of the cable must terminate in a C13 female socket connector (IEC/EN 60320-1), which plugs into a C14 male plug connector at the base of the lift column.</p> <p>Each robot is factory-equipped to accept one of two voltages, either 120VAC or 240VAC, depending on the country where the system is to be installed.</p> <p>Total power consumption per robot is 480 Watts (maximum), plus up to 480 Watts (maximum) for prompter and other accessories powered through an auxiliary power socket at the base of the lift column. Ensure that all equipment plugged into the auxiliary power socket can accept the same AC voltage supplied to the pedestal.</p> <p>Each power supply circuit must be protected by a 15A fuse or circuit breaker (for a 120VAC circuit), or an 8A fuse or circuit breaker (for a 240VAC circuit).</p> • One stranded CAT5E Ethernet cable per robot, long enough to accommodate the full range of motion of the head, lift, and pedestal. <p>One end must plug into an Ethernet jack, and the other end must terminate in a male RJ45 connector at the head.</p> <p>The maximum cable distance between the head and the Ethernet network switch in the control room is 100m (328'). This range can be increased using an Ethernet extender (not provided).</p> • Camera and accessory cables as required, including power cables, video cables, etc. All cables must be long enough to accommodate the full range of head/lift/pedestal movement. <p>A 2m (6.5') flexible sleeve (cable sock) is included to wrap the bundle of cables that runs between the pedestal base and the head.</p> <p>A 10m (32') flexible sleeve (cable sock) is included to wrap the bundle of cables that runs across the studio floor to the pedestal. Additional lengths can be ordered from Ross video.</p>

CamBot Robot System	Studio Requirements
<p>CAM-600XY-S3-PKG</p> <ul style="list-style-type: none"> • CamBot 600PT head • Furio SE three-stage robotic lift • Robotic XY pedestal <p>or</p>	<p>IMPORTANT: All cables that run to a robot or to a robotic head must contain stranded conductors only. Solid conductors are not acceptable because they are more likely to deteriorate due to robotic movement, causing intermittent data transmission. It is also important to use very light, flexible cables to reduce drag.</p> <p>Studio requirements are as follows:</p> <ul style="list-style-type: none"> • One AC power supply cable per pedestal, long enough to accommodate the full range of pedestal movement.
<p>CAM-700XY-PKG</p> <ul style="list-style-type: none"> • CamBot 700PT head • Furio SE three-stage robotic lift • Robotic XY pedestal <p>or</p>	<p>The pedestal end of the cable must terminate in a C13 female socket connector (IEC/EN 60320-1), which plugs into a C14 male plug connector on the pedestal's connection panel.</p> <p>Each pedestal is factory-equipped to accept one of two voltages, either 120VAC or 240VAC, depending on the country where the system is to be installed.</p> <p>Total power consumption per robot is as follows:</p> <ul style="list-style-type: none"> - CAM-600XY-S2-PKG: 450 Watts (maximum). - CAM-600XY-S3-PKG or CAM-700XY-PKG: 600 Watts (maximum), plus up to 600 Watts (maximum) for prompter and other accessories powered through a C13 female auxiliary power socket.
<p>CAM-600XY-S2-PKG</p> <ul style="list-style-type: none"> • CamBot 600PT head • S2 two-stage robotic lift • Robotic XY pedestal 	<p>Each power supply circuit must be protected by a 15A fuse or circuit breaker (for 120VAC circuits), or an 8A fuse or circuit breaker (for 240VAC circuits).</p> <ul style="list-style-type: none"> • One stranded CAT5E Ethernet network cable per robot, long enough to accommodate the full range of pedestal/lift/head movement. One end of the cable connects to the robotics Ethernet network. The other end must terminate in a male RJ45 plug, which connects to a female RJ45 jack on the pedestal's connection panel. <p>The maximum cable distance between the pedestal and a dedicated Ethernet network switch is 100m (328'). This range can be increased using an Ethernet extender (not provided).</p> <ul style="list-style-type: none"> • One sync reference cable per robot, terminating in a standard male BNC plug which connects to a standard female BNC socket on pedestal's connection panel. This is required only for AR/VS (Augmented Reality and/or Virtual Set) applications. <p>AR/VS applications require that the same sync reference signal be delivered to each robot, to each camera, and to the AR/VS graphics rendering system.</p> <ul style="list-style-type: none"> • Camera and accessory cables as required, including power cables, video output cables, prompter video cables, etc. All cables must be long enough to accommodate the full range of pedestal, lift, and head movement. <p>A flexible sleeve (cable sock) is included to wrap the bundle of cables that runs between the pedestal base and the head.</p> <p>A 10m (32') flexible sleeve (cable sock) is included to wrap the bundle of cables that runs across the studio floor to the pedestal base. Additional lengths can be ordered from Ross video.</p> <ul style="list-style-type: none"> • If the robot is to be used for on air shots that include pedestal floor movement, the floor must be extremely smooth to ensure high-quality shots. For additional information about methods to optimize the quality of moving shots, see CamBot XY Pedestals and Moving On Air Shots (5100DR-821-xx).