

# Site Requirements for X300 and X350 Pan & Tilt Heads

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

This document describes the studio equipment and studio environment required to support Ross X300 and X350 robotic pan & tilt heads. It also includes an overview of the heads and lists optional mounting accessories.

The major sections of this document are as follows:

- [“About Ross Robotics”](#) on page 1
- [“Overview of X300 and X350 Pan & Tilt Heads”](#) on page 2
- [“About Payload Design and Load Balancing”](#) on page 6
- [“General Studio Requirements”](#) on page 7
- [“Power and Networking Requirements”](#) on page 7

**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.

For More Information About...

- Installing and cabling an X300 or X350 head, see ***Quick Start Guide for X300 and X350 (5100DR-081-xx)***.
- Configuring an X300 or X350 head, see ***Technical Manual for X300 and X350 (5100DR-082-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)***.
- Studio site requirements for Furio robots, see ***Furio Studio Site Requirements (5100DR-023-xx)***.
- Studio site requirements for CamBot robots, see ***CamBot Studio Site Requirements (5100DR-022-xx)***.
- Ross Robotics products and accessories, and for product brochures, contact your Ross Video sales representative.

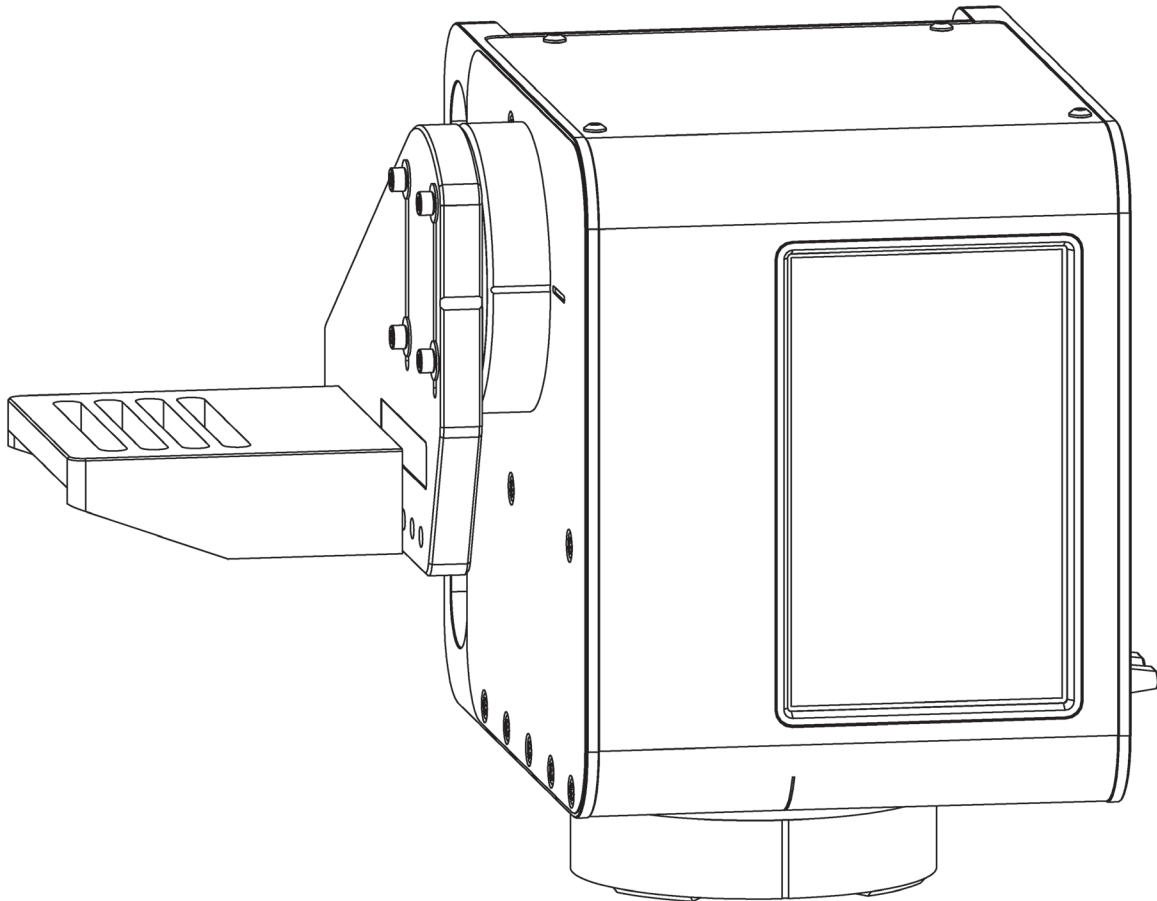
## About Ross Robotics

Ross Video has the most complete studio robotics offering available, whether you are looking for the unparalleled smoothness of a track-based system, the unbeatable flexibility of a free-roaming pedestal, or the simple efficiency of a standalone pan & tilt head. All Ross robotic systems are designed, developed and manufactured in-house, using state-of-the-art technologies that provide industry-leading accuracy, precision, and payload capacity. Ross Video designs, manufactures, and sells a wide variety of camera motion systems to suit your needs.

## Overview of X300 and X350 Pan & Tilt Heads

The X300 and X350 robotic pan & tilt heads are compact, affordable, and perfect for robotic camera applications where no prompter is required. With a 15 lb (6.8 kg) payload capacity, they can handle practically any ENG or box camera and lens combination. Based on decades of robotic pan & tilt head design experience, the X300 and X350 offer the smooth, accurate movement that you've come to expect from Ross Robotics, while also incorporating all of the advanced motion control benefits of MotionDirector technology, including keyframed moves.

**Figure 1** shows the X350 pan & tilt head.



**Figure 1** - Ross Robotics X350 Pan & Tilt Head

## Key Features and Specifications

This section lists some key features and benefits of X300 and X350 pan & tilt heads.

For complete technical specifications, including connector pin-outs, see **Technical Manual for X300 and X350 (5100DR-082-xx)**.

Features and benefits include the following:

- Compact form factor. Without a camera cradle, each head measures approximately 5 7/8" W x 7 3/8" H x 7 3/4" D (150 mm W x 190 mm H x 135 mm D).
- Highest payload in their class at 15 lbs (6.8 kg)
- Fully controllable through Ross SmartShell and/or a free DashBoard application. Compatible with existing Ross Robotics systems.
- IP-based control interface
- Web page interface for remote configuration and settings backup
- Pan axis range of  $\pm 178^\circ$  (355° total)
- Tilt axis range of  $\pm 178^\circ$  (356° total)
- Pan and tilt speed range of 0.1° to 45° per second
- Maximum pan and tilt acceleration rate of 60°/sec<sup>2</sup>
- Positional accuracy and repeatability of  $\pm 0.5^\circ$
- Anti-backlash gears in the drive train to ensure smooth motion suitable for on-air shots
- Net weight of approximately 11 lbs (5.0 kg)
- Maximum power consumption of 144W
- Digital control of a wide range of Canon and Fujinon full servo serial lenses
- Analog lens control port (DE 15 socket)
- Additional features available on the X350 only:
  - › Built-in touch screen configuration interface
  - › Power out (12 VDC, 5 A max) for camera and/or accessories (4-pin XLR socket)
  - › Serial CAN bus control port (12-pin socket) for full compatibility with Furio Dolly, Furio SkyDolly, and Furio BlackBird Pedestal
  - › Serial digital camera control port (DB 9 socket)
  - › Axis encoders and position tracking data output for AR/VS applications (FreeD and/or ORAD via UART and/or UDP).
  - › Video sync input and output connectors (standard BNC), with LED to indicate connectivity. The sync signal enables the X350 head to synchronize its tracking data with AR/VS applications, ensuring high-quality tracking.

**Note:** The head does not generate a video sync signal.

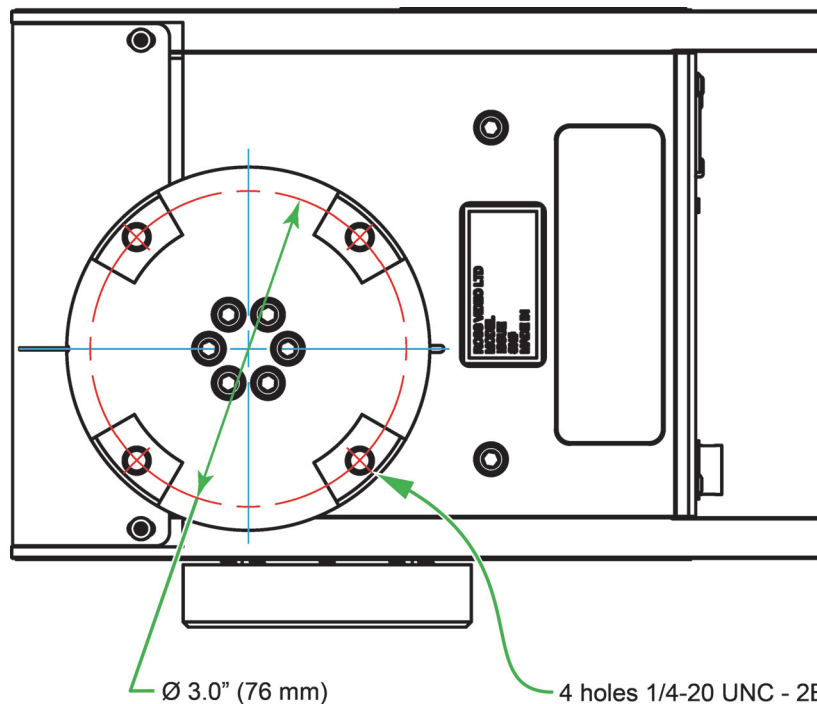
## What's in the Box?

Each X300 or X350 package contains the following:

- X300 or X350 robotic pan & tilt head, with mounting hardware
- Camera cradle attachment, with mounting hardware
- Lens control cable suitable for your analog or digital lens (to be selected when ordering)
- AC power adapter and line cord suitable for your location (based on shipping address or special request)
- Three camera screws and washers (1/4-20 x 5/8")
- Printed copy of this document — **Studio Site Requirements for X300 and X350 (5100DR-080-xx)**
- Printed copy of **Quick Start Guide for X300 and X350 (5100DR-081-xx)**
- USB key (**5100USB-101**) containing Ross Robotics user manuals, including **Technical Manual for X300 and X350 (5100DR-082-xx)**

## Mounting Options and Accessories

Each X300 or X350 mounts via four 1/4 - 20 UNC bolt holes in its base. Maximum screw penetration into the head is 3/4" (19 mm). **Figure 2** shows the mounting hole pattern on the bottom of the head.



**Figure 2 - Bottom View of Pan & Tilt Head, showing Mounting Hole Pattern (X300 shown; X350 mounting details are identical)**

Ross Video offers the following optional accessories for mounting your X300 or X350:

- **PM8 Pedestal Riser** — This is an 8" (20 cm) black metal pedestal riser with a flanged base and eight mounting holes (RRB-UNI-PM8). The PM8 Pedestal Riser can be mounted to any horizontal surface that accepts fasteners.
- **Universal Ceiling Mount** — This mount (RRB-UNI-CLM) clamps onto a section of lighting grid pipe, and is suitable for inverted mounting of the robotic head. It 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 48 mm (1.9"), maximum 51 mm (2"). The Universal Ceiling Mount is used in conjunction with a PM8 Pedestal Riser, which connects to the robotic head.

- **Wall Mount Bracket** — This is a sturdy metal bracket designed to fully support the robotic head without restricting pan and tilt range (RRB-UNI-WMB). The wall mount bracket must be securely fastened to a structural member, such as a wall stud.
- **Mitchell Tripod Mount Adapter** — This adapter (RRB-UNI-MA) is designed for use with a tripod or pedestal that has a Mitchell Mount plate. The adapter is used in conjunction with a PM8 Pedestal Riser, which connects it to the robotic head.
- **Tripods and Pedestals** — Ross Video sells a variety of Cartoni tripods and pedestals suitable for mounting our robotic pan & tilt heads. A PM8 Pedestal Riser is also required, as a mating adapter.

## Head Control Options

You can control X300 and X350 heads through Ross Video DashBoard and/or Ross Video SmartShell. You can also control the heads through the Furio API.

### DashBoard Control

The X300 and X350 pan & tilt heads can be controlled through the PT Head Control plugin, which is a free application within the DashBoard Control and Monitoring System. DashBoard enables you to control the robotic heads manually, and to create and recall presets. You can also add a USB joystick or other game controller.

The **DashBoard User Guide (8351DR-004-xx)** describes system requirements for DashBoard, and how to install DashBoard. DashBoard and the DashBoard User Guide are available as free downloads from the following location, under **Downloads**:

<https://www.rossvideo.com/products-services/management-systems/automated-production-control/dashboard/>

For information about using the DashBoard PT Head Control plugin, see the **User Manual for PT Head Control Plugin (8351DR-019-xx)**. This manual is available at the following location, under **Downloads > Manuals**:

<https://www.rossvideo.com/products-services/acquisition-production/robotic-camera-systems/studio-robotics/>

### SmartShell Control

SmartShell is a full-featured, enterprise level control system that can control all Ross Robotics devices, including X300 and X350 pan & tilt heads. The SmartShell computer communicates with robots and other components over a dedicated Ethernet network.

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

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

### Furio API Control

X300 and X350 pan & tilt heads use the Furio API, which allows direct control by Ross Production Switchers, OverDrive, and other third-party devices and controllers.

## Camera and Lens Control Options

X300 and X350 heads can control focus, zoom, and iris functions.

Controlling camera and lens functions requires a cable connection between the head and the camera, and between the head and the lens.

### Lens Control Options

Both the X300 and the X350 provide the following lens control options:

- Digital control of a wide range of Canon and Fujinon full servo serial lenses via a 10-pin Hirose socket on the head. If your lens requires digital control, a lens control cable suitable for your lens is included (to be selected when ordering):
  - › for Fujinon RD/ZD drives (10-pin at lens): Ross order code RRB-UNI-DLF10.
  - › for Fujinon RD/ZD drives (20-pin at lens): Ross order code RRB-UNI-DLF20.
  - › for Canon IASE drives (20-pin at lens): Ross order code RRB-UNI-DLC.
- Analog control of Canon (KTS or compatible) and Fujinon (BMD or compatible) lenses via a DE-15 socket on the head. If your lens requires analog control, a universal analog lens control cable is included: Ross order code RRB-UNI-ALC (to be selected when ordering).

### Camera Control Options

Camera control options are as follows:

- Camera control over IP via one of two Ethernet ports (RJ45 jacks).
- Camera control over serial digital connection (RS232/422) via a DB-9 socket (X350 only).  
**Tip:** If the camera can be controlled both over IP and through a serial digital connection, and you want to cascade (daisy-chain) the network connection from head-to-head, use the serial DB-9 socket for camera control. This leaves both Ethernet ports available for cascading the network connection.

## About Payload Design and Load Balancing

Ross Video designed the drive train of the X300 and X350 to perform smoothly, accurately, and reliably under full payload in demanding production environments.

We recommend you determine in advance which payload components will be mounted to the head, and how they will be secured.

The maximum payload is 15 lbs (6.8 kg).

For best results, design a payload that

- has a low moment of inertia (MOI). The MOI affects the amount of torque (rotational force) required to move the load. The smoothest starts and stops are achieved when the MOI is low. You can reduce the MOI by eliminating unnecessary payload weight, and by positioning as much of the weight as possible close to the tilt axis.
- can be balanced both horizontally and vertically around the tilt axis of the head, so its center of gravity is aligned with the tilt axis.

If safety tethers are required between the payload and the head, or between the head and a fixed point in the studio, consider the following:

- Tethers must be looped through both handles of the head, or through only the handle on the **payload side** of the head (preferred).

- All tethers must allow the full range of pan & tilt motion without excess slack, and without obscuring the camera lens.
- Safety tethers must not be dressed (bundled or zip-tied)!

## General Studio Requirements

All Ross Robotics equipment must be installed and operated in a suitable physical environment:

- Equipment must be installed in an indoor location not exposed to moisture.
- Acceptable operating humidity range is 10% to 90% RH, non-condensing.
- Acceptable operating temperature range is 0° C to 45° C (32° F to 113° F).
- Acceptable storage and transport temperature range is -30° C to +70° C (-22° F to 132° F).

After exposure to temperatures beyond the acceptable operating temperature range, the temperature of the head must be brought to within the acceptable operating range before use.

**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.

## Power and Networking Requirements

Power and networking requirements for X300 or X350 pan & tilt heads are as follows:

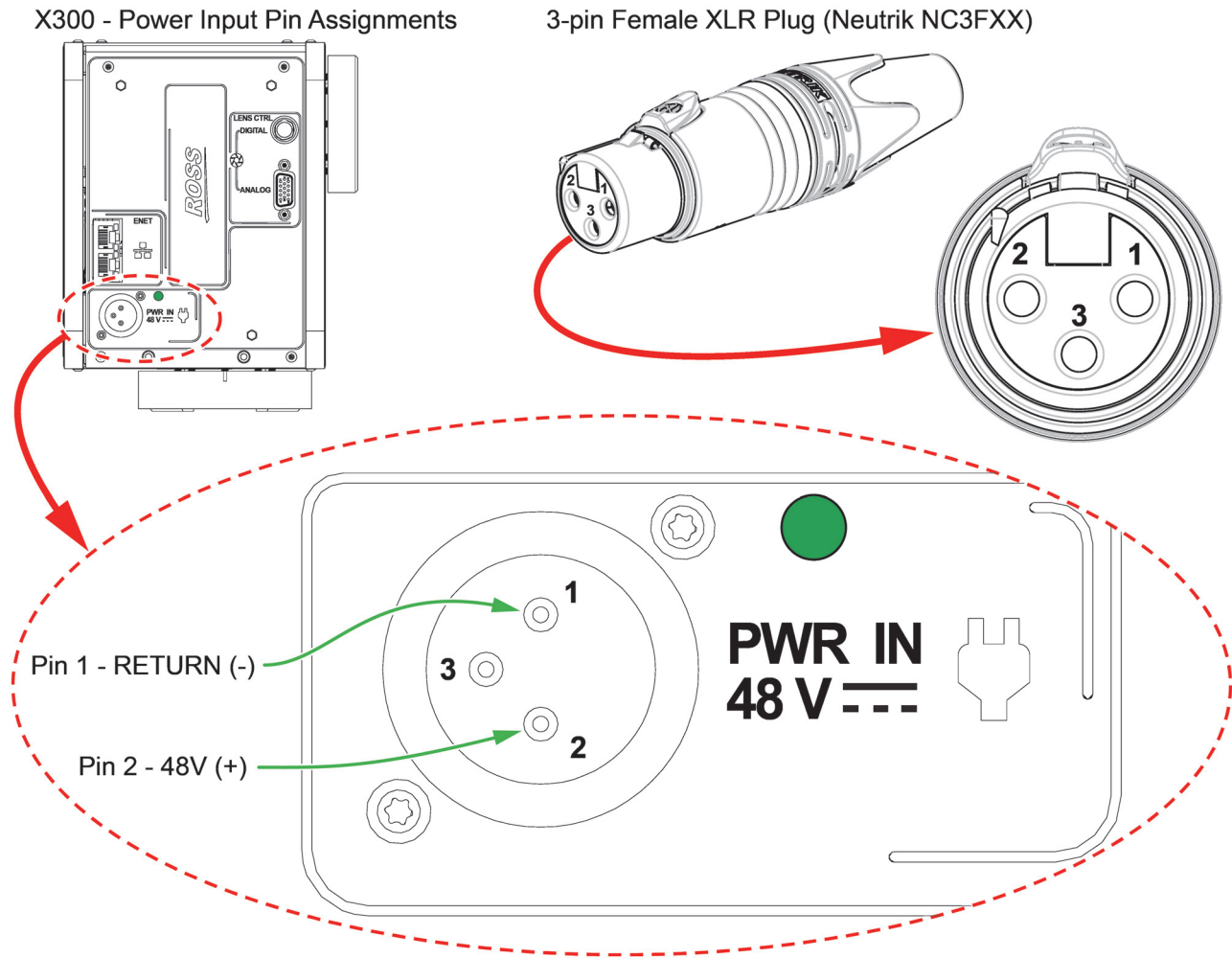
- One AC power supply socket per head.

Each head comes with an auto-sensing power adapter that meets the following specifications:

- › **Input:** Auto-sensing, accepting voltages between 85 VAC and 264 VAC, at a frequency of 47 Hz to 63 Hz.
- › **Output:** 48 VDC, 3.3 A, 160 W.
- › **Cabling:** Included with each head is a line cord with plug suitable for the country where the system is to be installed. The output of the power adapter is a 3-pin female XLR plug that connects to the head.
- › **Physical dimensions:** Approximately 2 7/8" x 1 3/8" x 6 7/8" (72 mm x 35 mm x 175 mm).

As an alternative to the provided power adapter, you can use a third-party power supply such as a rack-mounted power distribution unit:

- › Read and follow all instructions and guidelines provided by the manufacturer of the power supply equipment.
- › Follow all national and local electrical, fire, and building codes when installing power supply equipment and cables. Use DC circuit breakers when required.
- › The power supply must be capable of providing 160W minimum (48 VDC at 3.33 A). To avoid excessive voltage drop, the maximum DC cable length using 16 AWG conductors is 300' (91.4 m). Minimum tolerated voltage at the head is 36 VDC.
- › The power input connector on the head is a 3-pin male XLR plug (conforms to IEC 61076-2-103).
- › For the 3-pin female XLR socket, we recommend Neutrik NC3FXX.
- › Pin assignments are as follows: Pin 1 - RETURN (-); Pin 2 - 48 V (+); Pin 3 - not connected. See **Figure 3**.



**Figure 3** - Power Input Pin Assignments (X300 shown; X350 power input connector is identical)

- Circuit protection: The power supply circuit must be protected by a 15 A fuse or circuit breaker (for 120 VAC circuits), or an 8 A fuse or circuit breaker (for 240 VAC circuits).
- Ethernet connection to 100/1000 network:
  - › Each robotic head has two female RJ45 Ethernet ports for connecting to the IP network, and to the camera if camera control over IP is required. The head has an integrated 1x2 Ethernet switch, which enables daisy-chaining of heads unless one of the Ethernet ports is required for camera control over IP.
  - › The Ethernet cable must be stranded CAT5E, and the end that plugs into the head must terminate in a male RJ45 plug.
  - › The maximum cable distance between network nodes is 328' (100 m). This range can be increased using an Ethernet extender (not provided).

- One sync reference cable per X350 head, terminating in a male standard BNC plug which connects to a female standard BNC socket on the head.  
This applies only to X350 and is required only for AR/VS (Augmented Reality and/or Virtual Set) applications. 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.  
**Tip:** The X350 also features a **SYNC OUT** port (standard BNC) that enables you to provide the sync signal to another device.
- All cables that run 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.
- All cables must be properly dressed to
  - › allow the full range of pan & tilt motion without obscuring the camera lens
  - › avoid strain and load on the head
  - › avoid physical damage to the cables, such as can be caused by foot traffic, rolling equipment, etc.
  - › prevent risk to personnel, such as can be caused by tripping over loose cables
- Camera and accessory cables as required, including power extension cables, video cables, etc.