

EAGLE
PAN TILT SYSTEMS
Helping to bring your world
into focus

**Sales Guide to
Pan Tilt Systems**

Display Devices Inc.
5880 N Sheridan Blvd.
Arvada CO USA 80003
Toll free (877) 862-6865
(303) 412-0399

<http://www.eaglepantilt.com>

Revised 03/2005

Contents

INTRODUCTION	3
SYSTEM CONCEPT	4
SYSTEM ITEMS NEEDED.....	6
BASIC SYSTEM CONFIGURATIONS	8
ADVANCED SYSTEM CONFIGURATIONS	11
INSTALLATION / WIRING REQUIREMENTS RECOMMENDATIONS	17
DETAILED RS-485 CONFIGURATION	19
SERVICE ISSUES AND TROUBLESHOOTING	20
MAINTENANCE	21

INTRODUCTION

Welcome to the world of Eagle™™ pan tilt systems designed and manufactured by Display Devices, and marketed by Hitachi Denshi.

The document you are reading was created to help give you a working knowledge of the Eagle™™ pan tilt heads, controllers, and system accessories that we manufacture. We will cover the following items:

- ☉ System Overview
- ☉ System concept / system diagrams
- ☉ Items needed to make up a system
- ☉ Basic system concepts
- ☉ Advanced system concepts
- ☉ System wiring requirements
- ☉ Service related issues and troubleshooting
- ☉ Recommended Maintenance

Levels of previous experience with pan tilt systems vary greatly; even if you are familiar with other pan tilt systems, please read this document carefully and fully as these systems are different than others. Who knows, you might learn something new!!

All set? OK, let's get started!

Eagle™ pan tilt systems are:

- Made to exacting specifications at our plant in Colorado, USA
- Customizing to individual customer needs available
- Able to be used in “on-air” broadcast applications due to their smooth operation
- Quiet, sturdy, and reliable
- Easy to hookup for the installer and easy to use for the end-user
- Available in your choice of black or grey colors to match the operating environment
- Available for use with Hitachi, Sony, Panasonic, and other camera brands

Eagle™ systems are unlike most other pan tilt systems in that they are “intelligent”; each head contains its own microprocessor control for standalone operation. Many of the other systems on the market have “dumb” heads that can require more extensive control setups with intelligence.

Most of our other control equipment is microprocessor based; it gives us a definitive advantage in features, performance, and ease of use.

SYSTEM CONCEPT

Our original system concept was developed by examining what was on the market up until 1997. Based upon what we saw in other manufacturer’s equipment, both good and bad, we developed the Eagle™ system. This has been marketed and sold by Hitachi Denshi America since that time. Over the last two years, Hitachi Europe has also begun to sell the line as well. The good things that we wanted to build upon were:

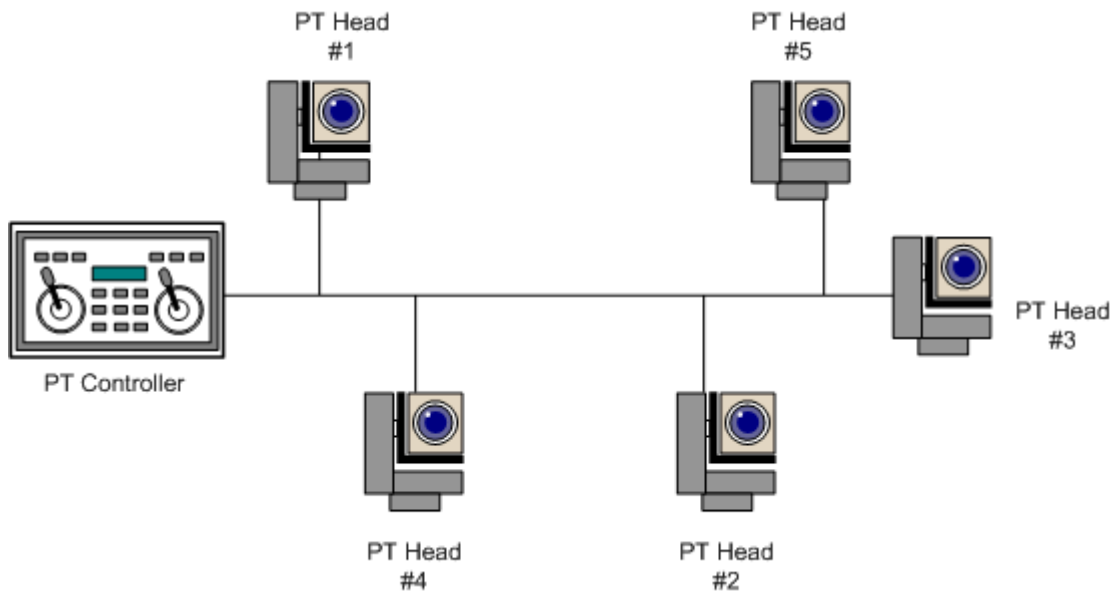
- Small to medium size heads
- Easy for installation personnel to install and maintain
- Easy for end users to operate
- Integrated camera power and control with integrated lens control.

- Quiet and unobtrusive whenever possible.
- Economical to purchase
- Easily expandable system

We also had a number of things that we didn't like:

- Systems that require purchasing components from multiple vendors. This is the standard ala carte method of pan-tilt system design: Buy a camera, RCU, and camera power supply from vendor A. Then buy a lens from vendor B. Buy the pan tilt from vendor C. Buy special system cabling from vendor C or D. Then, have it all integrated by installer E.
- Systems that were hard to install; many require large, multiconductor cable runs be strung to each head for power and control
- No integrated camera control and power. Many other systems leave it up to the end user to provide separate, expensive camera remote control units (RCU's) for each camera head in a system, in addition to extra cabling for those RCU's. They also don't provide camera power, requiring a separate camera power supply for each camera, and its' requisite power cable.
- No integrated lens control. Many other systems don't provide remote lens control, or require that the customers' expensive lenses be modified by the pan-tilt manufacturer before they can be used. This can void the lens' warranty in some cases, as well as causing a delay in the installation while waiting for the lens to be modified.
- Not economical to purchase. By the time a system is fully configured with PT heads, controller, special multi-conductor control cabling, camera power supplies for each camera, RCU's for each camera, and the extra labor for installation, this can make other systems more expensive.

Not true with Eagle™ systems! Buy a camera and lens; the camera power supply and lens controller are built into the pantilt head. Optional integrated camera control units can be added for many popular cameras. Eagle™ pan tilt systems don't require special cabling; they use standard off- the-shelf audio cable available locally. Our detailed instructions and QuickStart guides make it easy for even inexperienced installers to configure, install, and test a Eagle™ pantilt system.



The Eagle™ system control is based upon the RS-485 serial communications standard. This means that each piece of equipment has its own “address”, and will respond only to commands sent to that address or a global “ALL” command.

This allows all pieces of equipment to be hooked up to the same serial wiring “backbone”. Or the system can be designed in a star type (“home run”) configuration. They can also be “daisy-chained”, looped from one head to the next, etc. Or a mix of the above. The address number of the head does not matter with regards to the order of heads on the line.

The RS-485 wiring configuration is nearly immune to external interference due to the fact that it uses two balanced conductors and a ground wire. The balanced conductors transmit inverse pulses down the communications line, canceling out at the opposite end. Any high or low pulse that is not cancelled out are data bits, which are sent in a redundant manner to make certain that each command is heard and carried out correctly.

We do not process any of the video signals from the camera back to the control room. All Eagle™ pan tilts feature pass-through video and most have genlock connectors that loop the camera video output through the head to the connectors on the stationary pan tilt base. However, these are just pass-through connectors, and don’t affect the signal quality of the video. They are in place such that the number of rotating cables attached to the rear of the pan tilt head are kept to a minimum.

SYSTEM ITEMS NEEDED

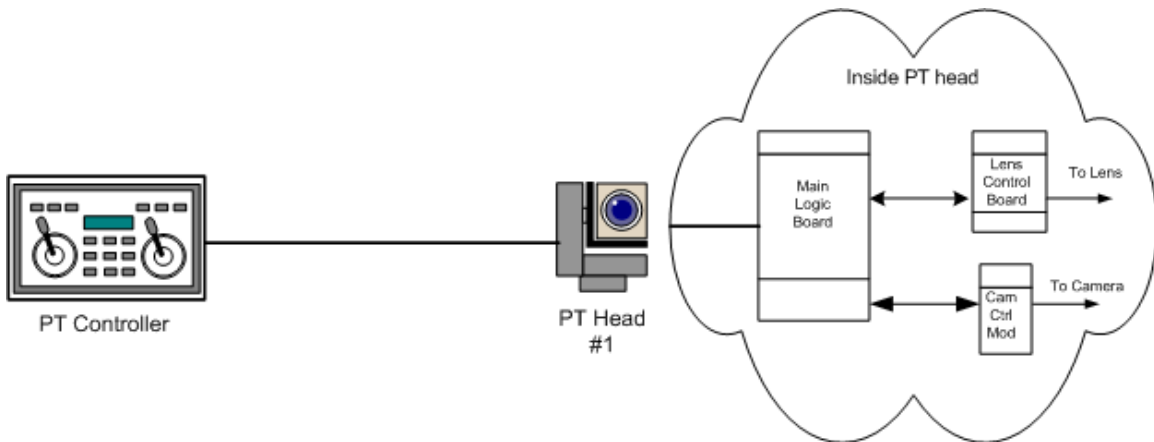
At the most basic, a Eagle™ pan tilt system would consist of a single pan tilt head, a 24 volt DC regulated power supply, and a means of controlling the head.

Control could be provided by an Eagle™ controller, software, or a third party control system such as BroadcastPix, AMX, or Crestron.

A large system could consist of up to 31 pan tilt heads with power supplies, and multiple controllers. Systems can grow larger than this with the use of RS-485 line amplifiers to boost the communications signals.

Eagle™ pan tilt systems are usually “hard-wired”; hooked up in permanent local configurations with the recommended wire types. However, some users have remote systems connected together by modem links over standard, dial-up telephone connections, fiber optic links, microwave links, or ISDN or TCP/IP network connections. All that is required for any system is that the component pieces are hooked up using RS-485 protocol. For example, most modems work using RS-232 protocol, but adapters are available to convert RS-485 into RS-232 to go into the local modem and then back out of the other modem at the far end. Similar adapters are available for or built into the other signal path types listed above.

As mentioned in the system concept, Eagle™ systems can include integral remote camera control units (RCU's). This is a small module that is fitted inside the pan tilt head. It receives commands from the pan tilt head main logic board via the same RS-485 serial data line that sends the commands to the pan tilt heads. All of the commands going over the RS-485 control line are received by the pan tilt head's main logic board. From there, they may be split out to the lens control board inside the head, or the camera control module also inside the head. This is all done automatically, completely transparent to the user.

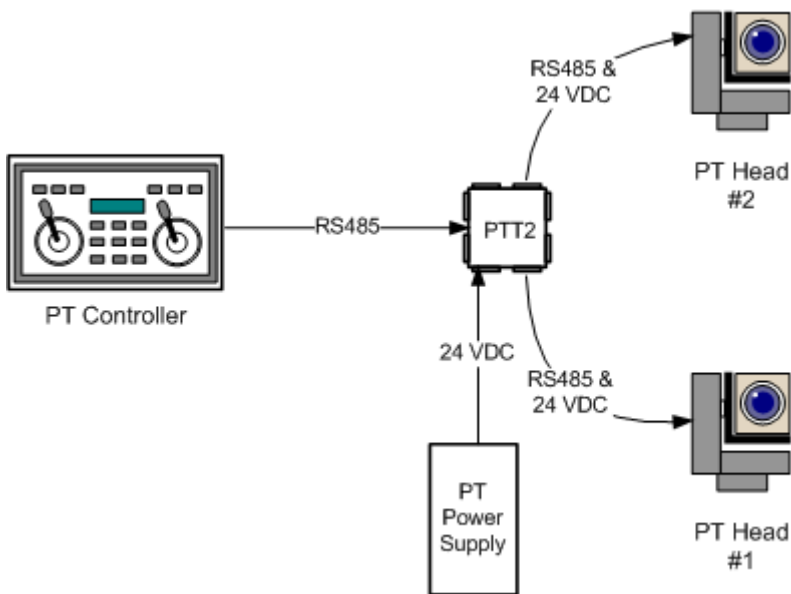


With the most recent Eagle™ heads, such as the PT-50 and PT-101 and PTmini, there is only one board that controls all functions of the pan tilt, lens, and camera. The formerly separate camera control and lens boards have been integrated into the main board using miniaturized surface-mount components. The communications flow still works the same way as mentioned above.

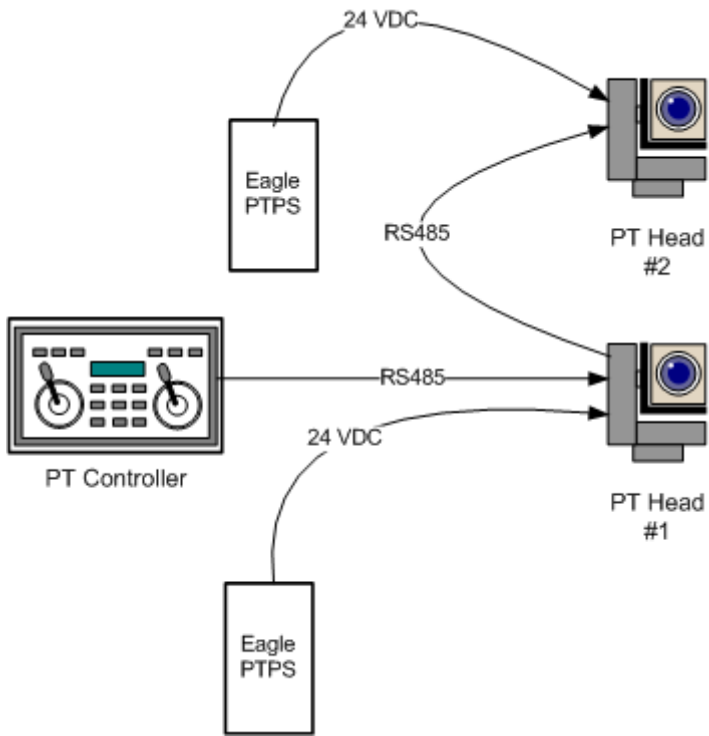
BASIC SYSTEM CONFIGURATIONS

Shown on the next pages are different system configuration diagrams, ordered from the most simple to the most complex. There are many different derivations along the way, too numerous to be shown here. What should be kept in mind is that Eagle™ pan tilt systems allow for nearly infinite configurations.

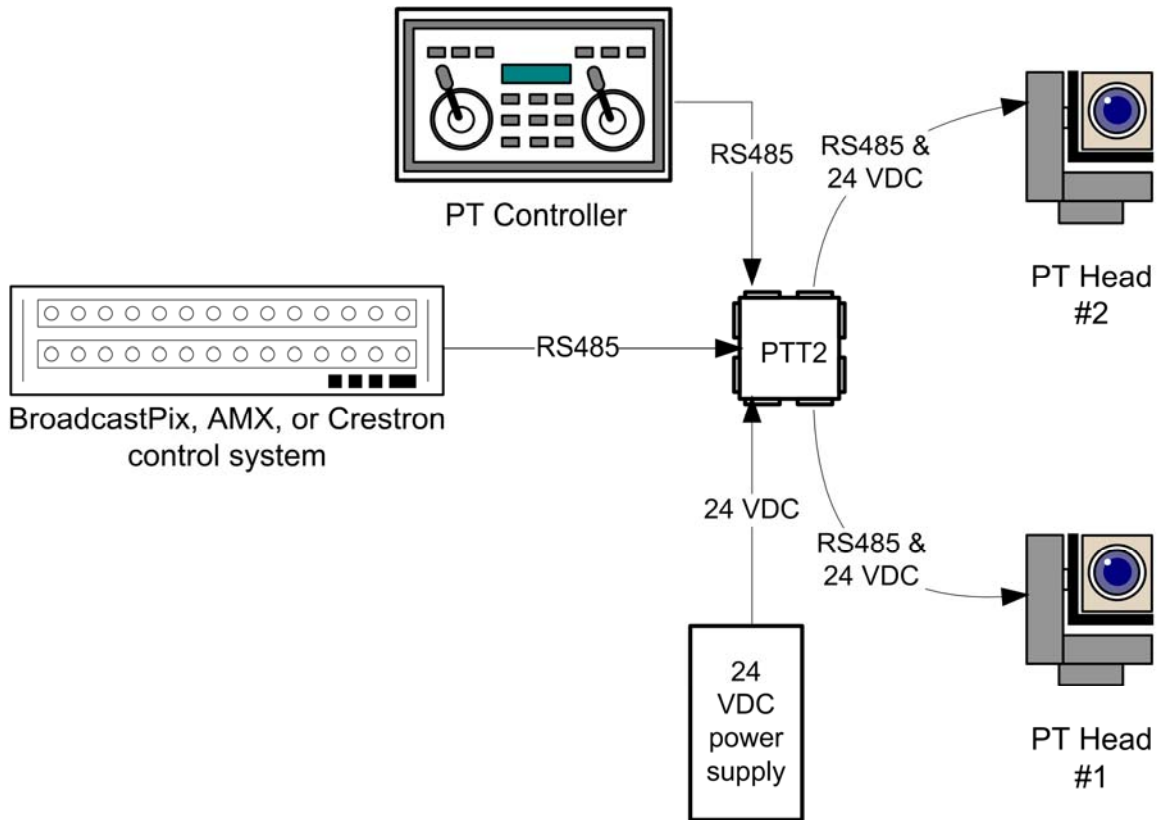
This is the system at its most basic; one head, one controller, one power supply. Note that even though a certain model of head and controller may be shown in the diagrams, any of our heads and controllers can be substituted for each other, as they all hook up in the same way. The only differences may be power supply requirements and control options. All controllers can be substituted for one another, but they do offer different feature sets.



The above system is very similar to the first system, but with the addition of a second head. The PT-T2 unit is a passive power and control splitter/combiner box. This means that it has no active circuitry, but is just a connection box. The correct size power supply must be chosen to provide enough power for the two heads and cameras.

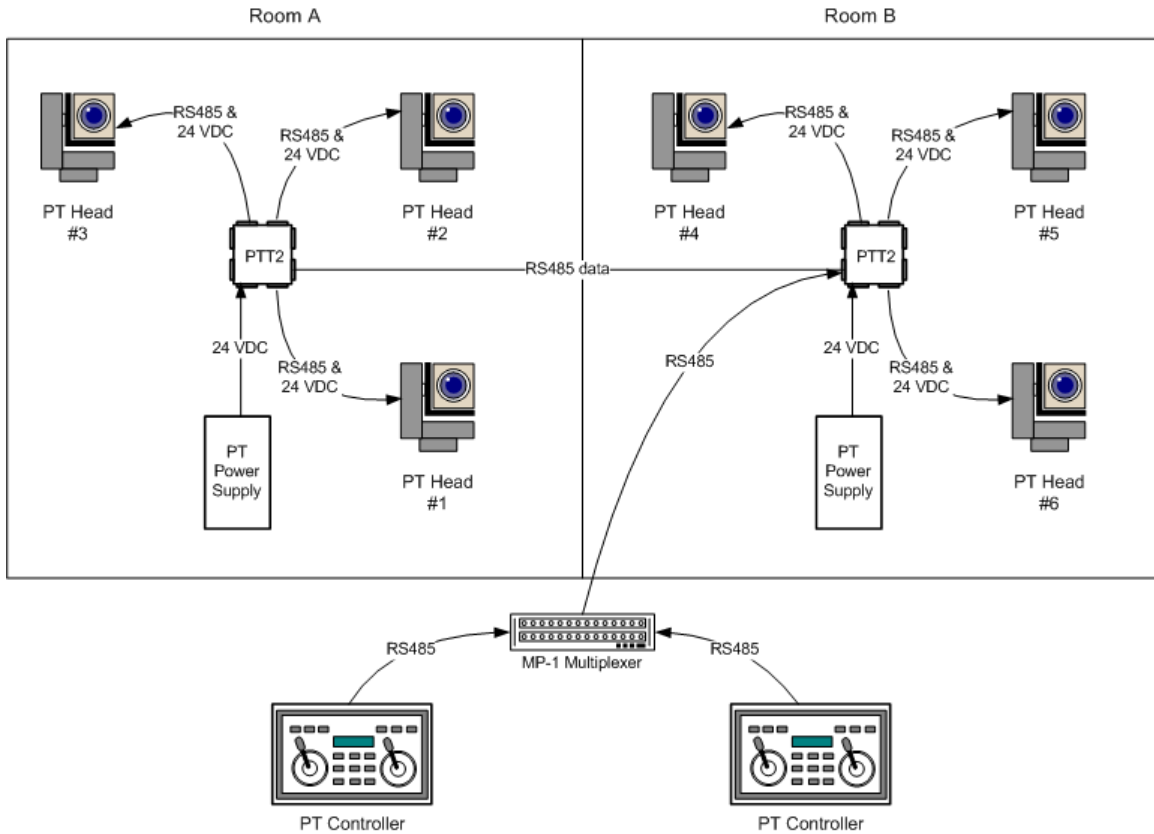


This system is very similar to the second system, but with the addition of a second power supply, instead of a shared power supply. This is sometimes done if the runs from one power supply to the heads are long enough that a large gauge cable would have to be used. As a rule of thumb, if the distance from the power supply to the head is greater than 250 feet, a separate power supply must be placed closer to the head. The RS-485 control line can be looped from head to head up to its' 4000' maximum system length.



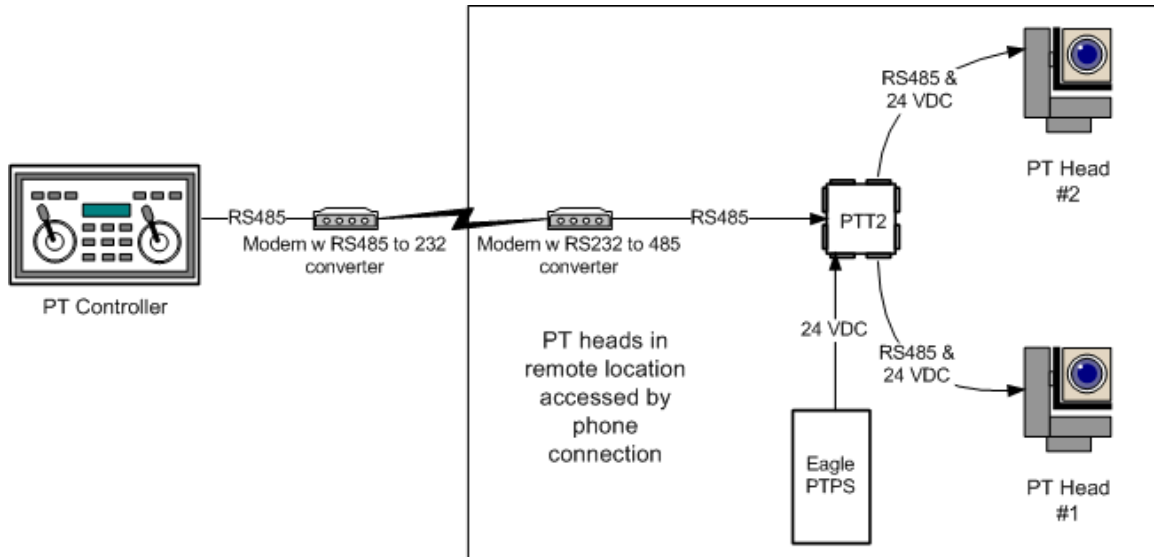
This system is very similar to the second system, but with the addition of a second control method. This is sometimes done if the system will usually be controlled by an instructor in front of the room, using an AMX or Crestron integrated control system, but with a Eagle™ PT controller in the control room to allow separate control by a technician. This can be useful if the instructor is too busy with a complicated presentation to also be running pan tilt heads. The one prerequisite with this system configuration is that only one control may be used at a time; if both controllers are used simultaneously, data packets will collide and cause unwanted results. To prevent this, the next configuration uses a multiplexer to prevent collisions.

ADVANCED SYSTEM CONFIGURATIONS



This advanced Eagle™ system uses multiple heads in two (or more) locations, with two controllers and a multiplexer. This system would allow two operators to simultaneously control two complete systems independently from one another. A system of this sort may be used in large reconfigurable meeting rooms, where normally the room is split into two or more smaller rooms, each with its' own meeting going on. The rooms may be combined, and all heads controlled from one or both controllers as needed. The multiplexer unit prevents the data packets from crashing into each other; it functions as a traffic light, buffering the packets until it is safe to send them on. This happens in microseconds, so that no delay in operation is noticed.

The multiplexer also works in conjunction with the controllers to allow exclusive control of a head or heads to be assigned to a controller. This prevents one operator from accidentally taking control of heads being used during a live production by another controller. Note that even though the two controllers must be hooked up to the same multiplexer, they don't have to be co-located in the same control room. All controllers may be used with the multiplexer, but only the PT-C and PT-TSC can reserve heads for exclusive use, i.e. "lockout" heads from access by other controllers on the line.

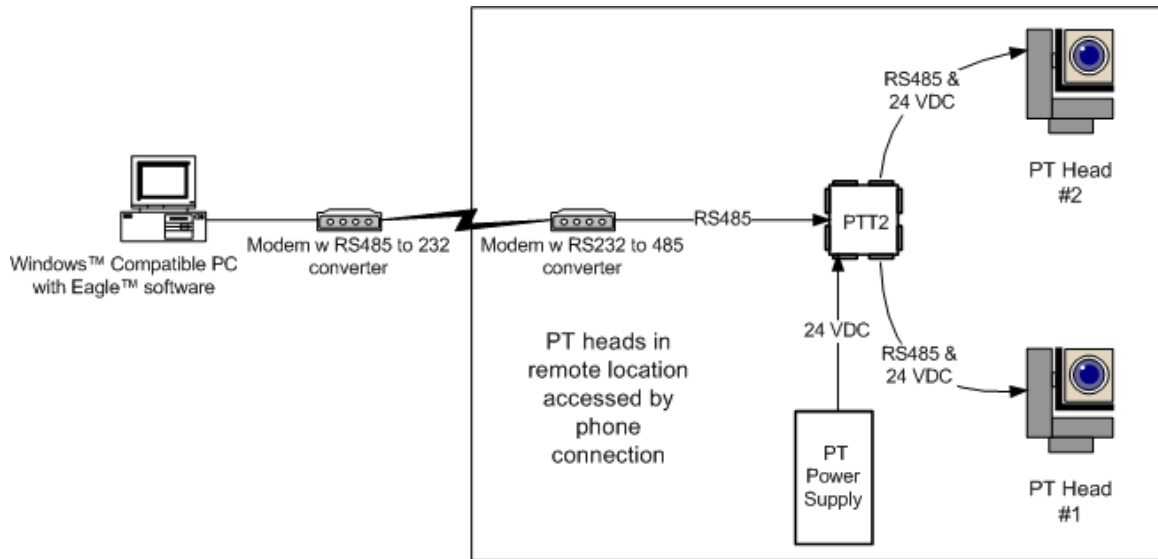


This advanced system uses multiple heads in two (or more) remote locations. This version is shown using the PT-AAM modem system, but may be hooked using microwave or RF transmission, or ISDN or Ethernet connection. The only two constraints are that return video must be provided to the control operator by some means; and that the signal from the controller must come out as RS-485 at the far end.

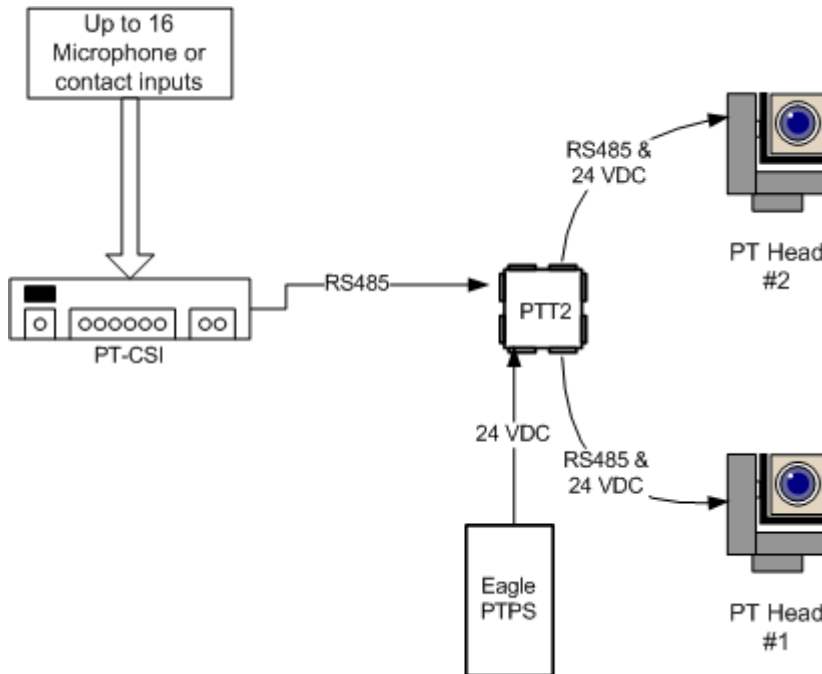
The PT-C and PT-TSC controllers have modem dialing software built in for use with the optional AAM modem systems. They are capable of storing up to four remote phone numbers. There can be either a single or multiple heads at each location, similar to a direct wire hookup. This works the same way for the other connection methods, except that no dialing is required; the system thinks that they are hooked up directly.

Remote Ethernet connections require the use of devices called port servers. They are a small electronic gadget that can be attached to an Ethernet backbone, and then has a serial output that would be hooked up to the pan tilt network. One of these devices is required at the controller, and then one or more required at the remote location. Each port server has a discrete IP (Internet Protocol) address, and can be configured to only respond to commands from a certain controller. This prevents anyone else on the Internet from gaining control unless authorized.

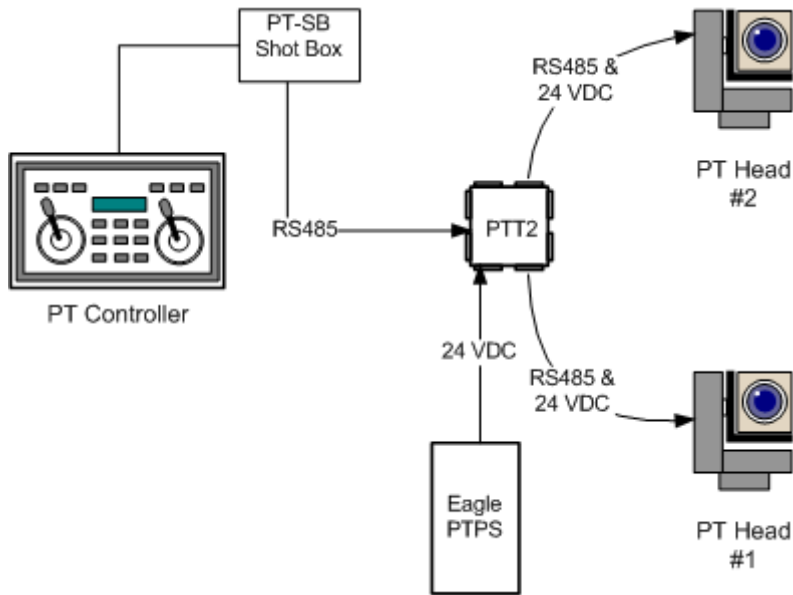
Some transmission methods do not directly accept RS-485 protocol in and out; in these cases adapters must be used to translate from / to RS-485. We can provide the RSA adapters that go from RS-232 to RS-485 or vice versa; any other adapters must be acquired separately from sources we can provide to you.



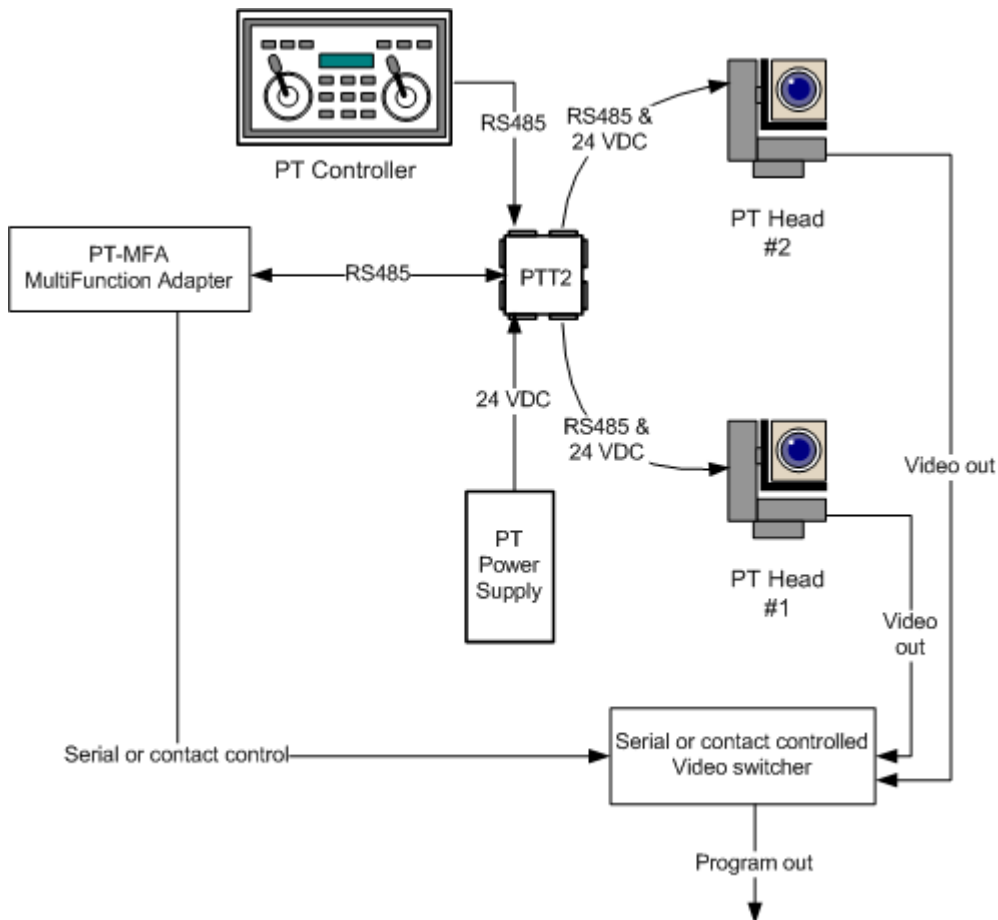
This is similar to the previous remote system, except uses a PC for control instead of a controller. This can use either our basic PC control software, or custom software provided by an end user. Our command list is readily available off of the website for programmers to write their own software, at <http://www.eaglepantilt.com>



This is a configuration showing one of the system accessories called the PT-CSI, or Contact to Serial Interface. It allows the connection of microphone contact closures, from an auto microphone mixer for example, to control the recall of preset positions stored in the pan tilt heads. The presets could be stored previously using a system controller. When a certain microphone gates "on" in front of a person speaking, the mixer sends a contact closure to the PT-CSI. The PT-CSI then recalls the preset for that person's location. The PT-CSI can also be programmed such that after a period of time it defaults to a preset that can be set to wide area shot of the room, or say an instructor's desk position.



This is a configuration showing one of the system accessories called the PT-SB, or Shot Box. It is a system accessory that is connected to the RS485 line, and can record every motion that occurs for later playback. It is normally used to store preset "shots", or motion paths, such as a wide panning shot of a room that slowly moves into a tight shot of a person on stage. If this is a standard opening shot for a show, it could be stored as one of eight preset shots, which can then be recalled by a system controller. The PT-SB will record anything on the RS485 line, no matter what head is being addressed. It can save approximately one full days' worth of commands from the RS-485 line.



This is a configuration showing another one of the system accessories called the PT-MFA, or Multifunction Adapter. It has eight relay outputs, along with serial in and out capabilities. It is controlled by a Eagle™ system controller or software. The relay outputs can be used to remotely turn on or off lighting, open and close drapes or curtains, turn microwave transmitters on/off, even turn pan tilt power supplies on or off remotely. The serial in / out port is used to accept data from or control serial controllable devices such as video switchers, audio switchers, etc. The PT-MFA would need to be programmed with the correct serial command strings based upon the piece of equipment being controlled; this needs to be arranged for in advance with Eagle tech support personnel.

As you can see from the preceding pages, there are many different possible configurations of Eagle™ equipment. While in most cases it is possible to simply “drag and drop” the different items into a correct configuration, please feel free to call upon us for consultation and a free system configuration diagram.

INSTALLATION / WIRING REQUIREMENTS RECOMMENDATIONS

As mentioned earlier, Eagle™ wiring is very simple, and doesn't require special cabling to install. Most installers have their own local favorites for cable suppliers, and you can use either 5 conductors in a single jacket cable (such as Carol C1323, or Belden 9418), or use two separate cables, one for data and one for power.

For a separate data cable, 3 conductors are required; usually 22ga microphone cable works best as it contains a jacketed pair wrapped with a drain (ground) wire and an overall foil shield, although the foil is not required due to the balanced nature of RS-485 communications.

For the power cable, a minimum of two conductors are needed. 18ga two conductor speaker wire works well for distances from the power supply to the head of up to 200 feet. If going further than this, you should double up the number of conductors, using all four conductors of the power supply or T2 splitter output to provide enough voltage at the far end to compensate for distance loss. Or you can use a larger gauge cable, but this can become hard to handle and may be too large for the terminal connector at the base of the PT head.

See the charts for wire gauge / distance requirements.

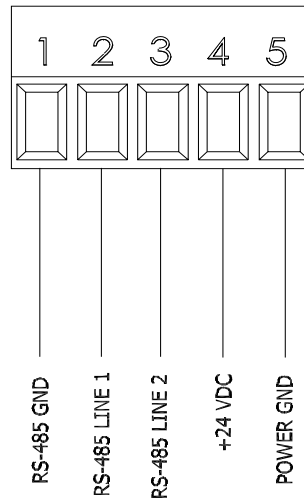
RS-485 communication cable gauge recommendations:

Distance in feet	A W G
20	28
50	26
100 - 1000	22
1000+	18

Power cable gauge recommendations, two conductor cable:

Distance in feet	AWG
up to 200	18
201-500	16
501-1000	12

WARNING !! BE CERTAIN TO FOLLOW THIS DIAGRAM AS SHOWN--IF POWER IS HOOKED UP TO DATA LINES, OR IF THE 24 VDC POLARITY IS REVERSED, THE CONTROL BOARD OF THE PAN TILT HEAD WILL BE DAMAGED!! THIS IS NOT COVERED BY WARRANTY!!!



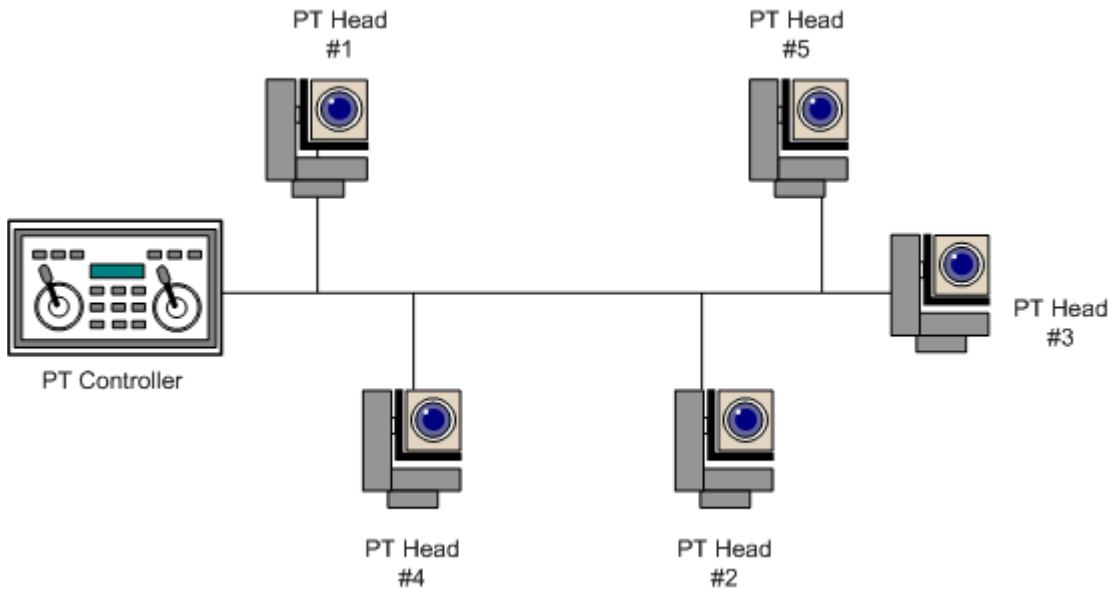
EAGLE PT-50, 100, 101 AND PT-220 HEAD INPUT WIRING

Shown above is the wiring connector at the base of all of our interior pan tilt heads. The pan tilt heads all have labels on them replicating this drawing to help prevent mistakes in wiring. Following this wiring is essential to making the system work correctly the first time; damage to the entire system can result if this is miswired.

DETAILED RS-485 CONFIGURATION

As mentioned on page 6, RS-485 systems can be implemented in a variety of ways. Star configuration, looping / parallel configurations, or a combination of both may be used. The important thing to observe with any system is that the RS-485 data line termination is done correctly; otherwise problems such as run-on will result from echoing characters on the line (with no termination) or little or no operation at all from too much termination. RS-485 specs call for the data line to be terminated with a 120 ohm resistor at two positions.

In any configuration (for example see the system below) there should be two points of termination: the controller, which is shipped terminated, and head #3 if it is the furthest from the controller. All heads are shipped with the termination jumper or switch in place to terminate. So, if you have a single head system with one controller, no changes need to be made. If you have a multiple head system, you will have to decide which head(s) to shut off the termination on. Usually, the furthest head from the controller is the one to leave terminated. If you are using a star configuration, or you don't know which head is furthest, simply choose one of them to leave terminated, and remove the termination jumpers or shut off the switch on the others.



SERVICE ISSUES AND TROUBLESHOOTING

We've found over the last eight years that most of the service issues and problems requiring troubleshooting happen during the initial installation. We have very few problems and failures after the system is installed, which is a good thing for both you and your customers.

Most of the initial system problems are due to incorrect wiring or lack of attention to reading the configuration information in the manuals. Simply having the installer read the manual and configuration information can reduce and/or eliminate this problem. For example, if the RS-485 comm lines are swapped, the LED on the head will blink, but no motion will occur. Simply paying attention to wiring color codes and destinations will eliminate this problem.

Following are several commonly seen problems and their simple solutions.

My pan tilt head was working, but now has stopped responding. I still have a picture from the camera, but have no control. What happened? Or, my system has never moved from the beginning; I have picture but no pan tilt or lens or camera control.

A: You are either trying to control a different head number, or the head has accidentally been readdressed to an unknown number, or the serial communications have failed or are not correct. If you are certain that you are trying to control the correct head, follow this procedure to regain control:

1. On the system controller, select CAMERA, ALL. This will talk to any head on the line. Try to move the head up, down, left, or right. If it responds, then you have good communications, and the head has simply been readdressed to another number. Follow the procedure in your manual to readdress the head to the number you want it to be.
- 2) If it doesn't respond, then check the serial wiring path from the controller to the head(s). If you have multiple heads, and the other heads work correctly, then your wiring path is most likely correct, but should still be tested. Try moving the non-working head to a known working location and retesting.
- 3) The red LED on the side panel of the head is for comm troubleshooting and status. If a head is correctly wired and addressed, when you move the joystick, the LED will glow solid, with some modulation (flickering) seen as you move the joystick. If the LED comes on solid upon power up, then the RS-485 ground and one of the comm lines may be reversed. Check your wiring again. If the LED never comes on solid, but only flickers, then either the head is hearing traffic for another head, or the RS-485 A & B comm lines are reversed.

If you are certain the head is addressed properly, then swap the A&B comm lines and test again.

If it still doesn't work at a known good location with the controller set to CAMERA-ALL, you have swapped the comm lines, and tried readdressing, then

the comm driver chip may be faulty. Contact tech support at (877) 862-6865 or www.eaglepan tilt.com

My lens control isn't working correctly; the lens goes to one end of its range and wont move.

The lens type has been set incorrectly. The Eagle pan tilt system is capable of using either servo drive teleconferencing lenses, or DC drive C-mount lenses. If set to the wrong type, this symptom will result. Verify the type of lens you are using and check the lens type as shown in your manual.

I am trying to set up a preset shot, but the head isn't returning to the correct position or zoom/focus setting.

This could be caused by a number of things. First, if using a teleconferencing lens (TYPE 2), make sure you are going into POSITION mode (POS button) before trying to set the preset. If you are not in POSITION mode, the lens' zoom and focus settings cannot be memorized. Also, the pan and tilt joystick must be moved for the head's position settings to be recorded. If the zoom and focus settings are retrieved correctly, but the head is landing high or low when recalling, then the weight balance of the camera/lens assembly is probably off from front to rear. The assembly must be centered from front to rear to provide accurate recall; if it is balanced too far to the front, then it will probably be low in recalling presets above horizontal. If balanced too far to the rear, it will be high in recalling presets above horizontal. Remove the camera/lens assembly as needed in order to check the balance, and replace it in the correct position.

My head starts moving on its own after going to the home position; why?

After August 10, 2004 model 50 and 101 heads automatically recall preset 1 after going to the home position at power up. This can be used to provide a user settable "home" position.

MAINTENANCE

Our pan tilt heads require very little in the way of maintenance. About the only thing that should be checked yearly is the grease used in the worm gear drives. The covers of the PT head may be removed and new white lithium grease can be added sparingly to the worm gears. The head can also be checked for any excessive play in the drive system at this time. If objectionable play is detected, call tech support for advice on how to adjust the worm gear system.