Build it Yourself PTZ range

Installation and Operation Manual

Low Speed PTZ Head with Built-In Receiver

24V AC 10 watts model

Models Covered
PTZ850

Version 1.1

CONTENTS TABLE

Please read this operation manual carefully *before* installing and using this unit !!!!

Please read the following;

1. Please read the operation manual carefully before installing and operating the product.
2. The actual PTZ head requires a 24v AC power supply. The rated output voltage for connecting a camera is 12V DC under load.
3. During the course of transportation, storage and installation, the product should be handled with care avoiding vibration and any weight pressure.
4. Do not attempt to disassemble the unit. In order to prevent electric shock, do not remove screws or covers.
5. Always use and stick to current electrical safety standards to install and use the PTZ head. Use a correctly rated power supply. The RS-485 and video signal cables should be kept way from other high voltage equipment such as mains cables and especially fluorescent lights. Using an anti surge protection device is recommended to prevent damage from lightning and mains surges. Damage by lightning or mains voltage surges is not covered under the warranty.

KEY FUNCTIONS

Description of Functions

This internal/external PTZ head with built-in receiver is a hi-tech CCTV product and is aimed at those who want to build their own PTZ systems. It has a panoramic PAN/TILT movement and horizontal limit switcher, an internal multifunctional decoder and settings for selecting various baud rates.

1. **Integrated Multi-Protocol Decoder**
   a. The integrated multifunctional decoder can communicate with 9 different protocols. The baud rate can be independently set allowing compatibility with numerous systems with selectable baud rates from 2400 bps to 19200 bps. Dip switches control the selection of the protocol, baud rate and termination resistor thus making this PTZ head easy to set up and use.
   b. This PTZ head uses RS485 serial control and can address from 1 to 511 cameras using binary addresses.

2. **Integrated Speed-Variable PAN/TILT**
   a. The PTZ head can turn 355° horizontally with a speed of 5° per second.
   b. The PTZ head can tilt -50° ~ +50° vertically with a speed of 5° per second.

3. Special PTZ850 Features

a. Compact and attractive appearance, indoor and outdoor design.
b. Heavy Duty Motor
c. Built with flame retardant ABS material
d. Adjustable horizontal Limit Switcher
e. Capable of operating with a load up to 6Kg.
f. RS485 Data Communication
g. Integrated Multifunctional Decoder with multi-protocols & baud rates
h. Line Scanning Function

Getting the PTZ Head up and running!

Do you KNOW how to install PTZ equipment that is controlled by RS485 data signals?

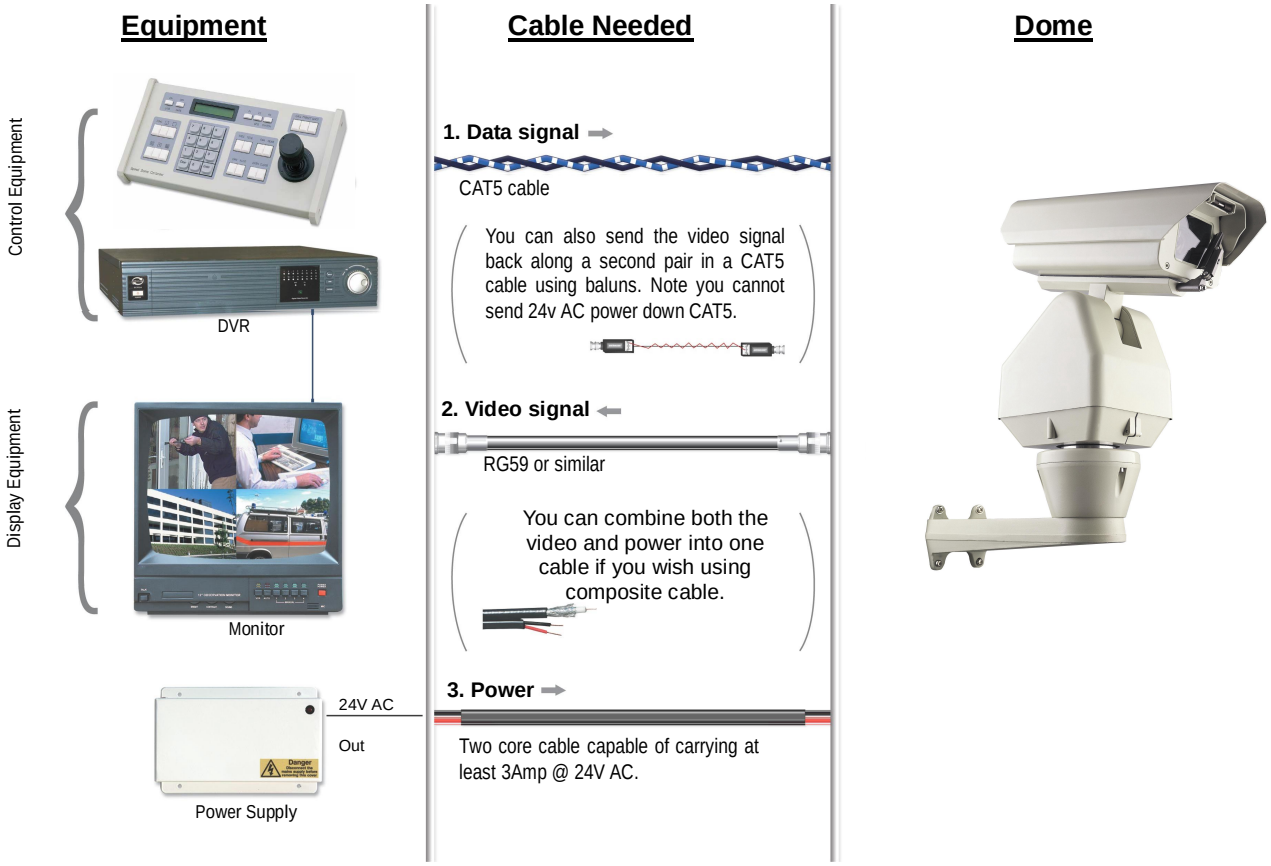
If not please read the following introduction to PTZ >>>….

Overview- introduction to fitting PTZ equipment

Generally speaking, PTZ cameras requires four things;

1- They require a power supply and a cable to supply this power to the dome. Often, external PTZs are 24V A.C but some mini pan and tilt domes are 12V.
2- They require a cable to get the video signal back to the monitor or recording device.
3- They require a cable to transmit the "RS485 control signal" from the keypad or DVR to tell the dome to pan, tilt and zoom etc.
4- They require something to control them, either a keypad or a DVR.

The following diagram indicates the basic cable requirements for a PTZ system.

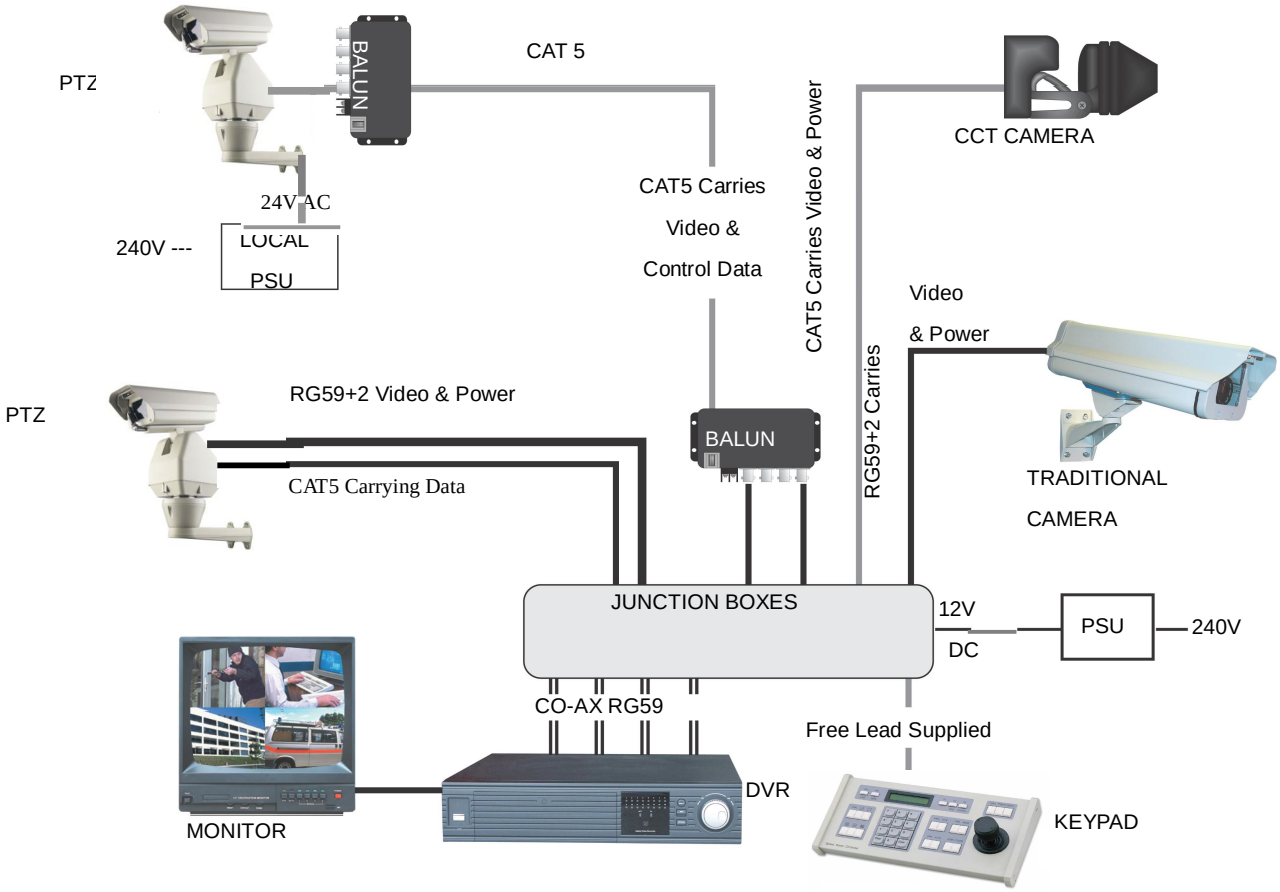


You can get "composite" cables that will carry both the power and the video signals and this has the benefit of combining two of the three cables into one. You may choose to power the dome locally to it, so you may only need to get the video signal back from the dome and the RS485 control signals to it. If this is the case you may choose to use a pair of BALUNS. By using baluns you can send the video signal and control signal down the same CAT5 cable just using different cores for each signal.

The control signal (RS485) is nearly always sent along a “twisted-pair” type cable. The twists in the cable help prevent interference affecting the data signal by “shielding” it. Many installation companies use a CAT5 type or similar cable to run out to the domes to carry the data signal.

If you are considering using baluns please note - DVR’s tend to require very good video signals to function correctly and “passive baluns” can loose some signal strength over the 50 metre mark so try to restrict the use of passive baluns to below 50 metre cable runs when using them with DVRs. Above this distance perhaps consider an active balun. Active baluns require power, passive baluns do not.

You can mix and match how you wire up your PTZ installation and the following general diagram gives you a guideline about how to do it. Remember this is a GUIDE and is not an instruction what to fit!



Many installation companies can get the power and video signal correct, but struggle with the control of the PTZ using the keypad or DVR using the RS485 data.

The key to successfully installing the data cabling to the PTZ is to get the basics right. Use a quality data cable such as CAT5 (never use just a standard untwisted cable such as alarm cable for the RS485 signal).

Also, you must follow the RS485 wiring convention; the following section explains this.

RS485 Wiring methods & Tips >>>>>

1. Characteristics of RS485

As specified by RS485 standards, RS485 is a half-duplex data transmission type with characteristic impedance of 120 Ω. The maximum load capacity is 32 units (PTZs, keyboards and DVRs).

2. Transmission distances of RS485 Signals using CAT5 or similar cables

Selecting a CAT5 or similar sized twisted pair data transmission cable, the maximum theoretical transmitting distances are as follows:

Baud Rate	**Maximum** Transmitting Distance
2400 Bps (PELCO-D)	1500m
4800 bps	1000m
9600 bps	600m

PLEASE NOTE - Using inferior cables, or installing the PTZ in an environment with strong electromagnetic interference, or connecting a lot of PTZ domes to the same cable carrying the RS485 signal will reduce the maximum transmitting distance.

3. RS485 Connection methods

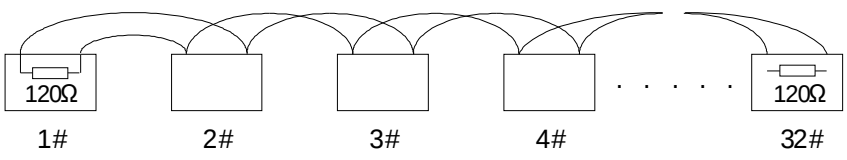
METHOD 1 – ***DAISY CHAIN CONNECTION.***

The general RS485 standard recommends a "daisy chain" connection of equipment that is to be controlled. This means that the control cable is looped out of the one dome to the next dome and so on. The last dome in the line is then fitted with what is known as a "termination resistor". This has a value of 120 Ω.

The resistor is built into the PTZ Head and is activated by moving DIP10 to 'ON' on the 10 way dipswitch. The keyboard itself generally has a built-in 120 Ω resistor. These termination resistors help make the signal more stable and give the system better reliability so the PTZs function as expected. A common mistake installers make is not making sure the 120 Ω resistor is switched ON in the LAST PTZ. Also installers often select the resistor to ON in another PTZ in the chain, these errors will make control of the PTZ unpredictable.

A simplified Daisy chain is shown below;

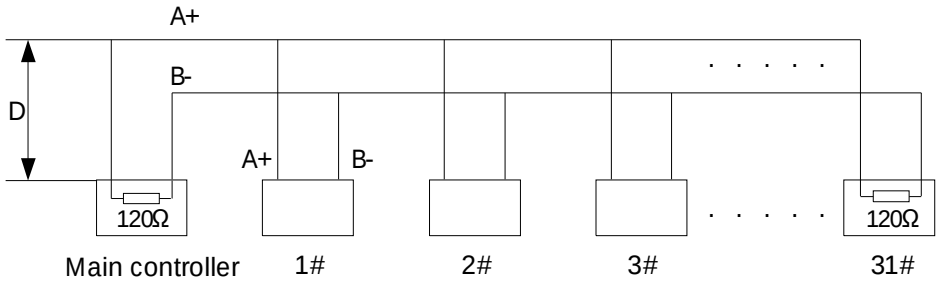
This first diagram shows the cables looping in one PTZ and out of another.



Standard Daisy-Chain connection for the RS485 PTZ control signal

(just the last PTZ only has the 120 Ω resistor set to on, the first device is the keyboard and has the 120 Ω built in as default)

This next diagram is a slight variation on the Daisy Chain arrangement. Again it's one cable going out to all the PTZs but instead of the cable going into each PTZ then back out to the next one, a junction box is used to "Spur-Off" to each PTZ. Whilst this can be done THE SPUR LENGTH (D) must be NO MORE THAN 7 metres!!!!!!!!!!!! The overall cable length between the Controller and the last dome is limited to around 300 metres in such an arrangement.



Daisy-Chain connection WITH SHORT SPURS for the RS485 PTZ control signal

(one main radial with very short spurs to each PTZ off it, keeping the spurs to less than 7 meters)

STAR method of connection.

In some circumstances you may need to adopt a star configuration for practical purposes. For instance, all the PTZs may be so scattered on a large site that running out separate spurs to each dome in a "STAR" array is the only practical solution.

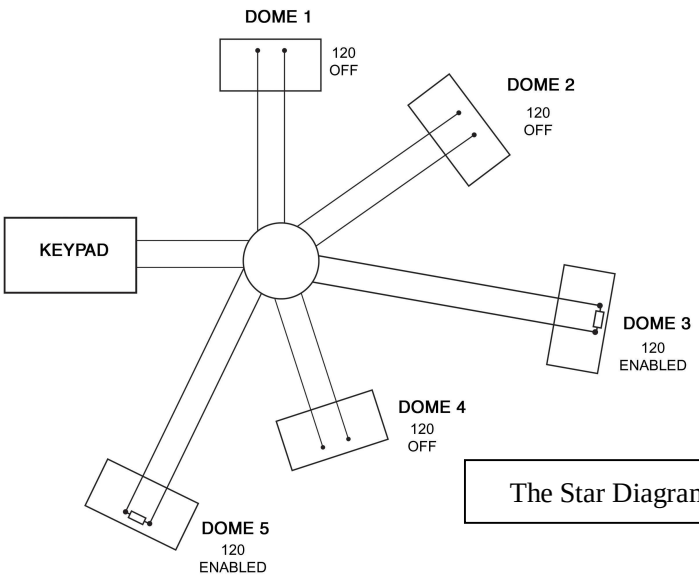
So how do you do this in practice?

The termination resistors must be set in the two domes that are farthest away from each other, such as PTZs 3 and 5 in the following "Star diagram". Note that all the other PTZs do not have the 120ohm resistor set.

As the star configuration is not in conformity with the requirements of RS485 standards, problems such as signal reflections may arise, especially when there are long cable connections. The results are that control signals are decreased and the PTZ may not respond to, or just responds intermittently to the controller.

If your STAR circuit is not too extensive with each spur in the region of 20-50 metres you can expect quite good reliable performance using this technique. If you experience any problems though, there is a RS485 distribution box available CODE PT750 to help overcome any problems.

The Star circuit for wiring PTZ's.
The two furthest domes need the 120ohm resistors enabling.



The Star Diagram

Overcoming RS485 data loss using an RS485 distributor

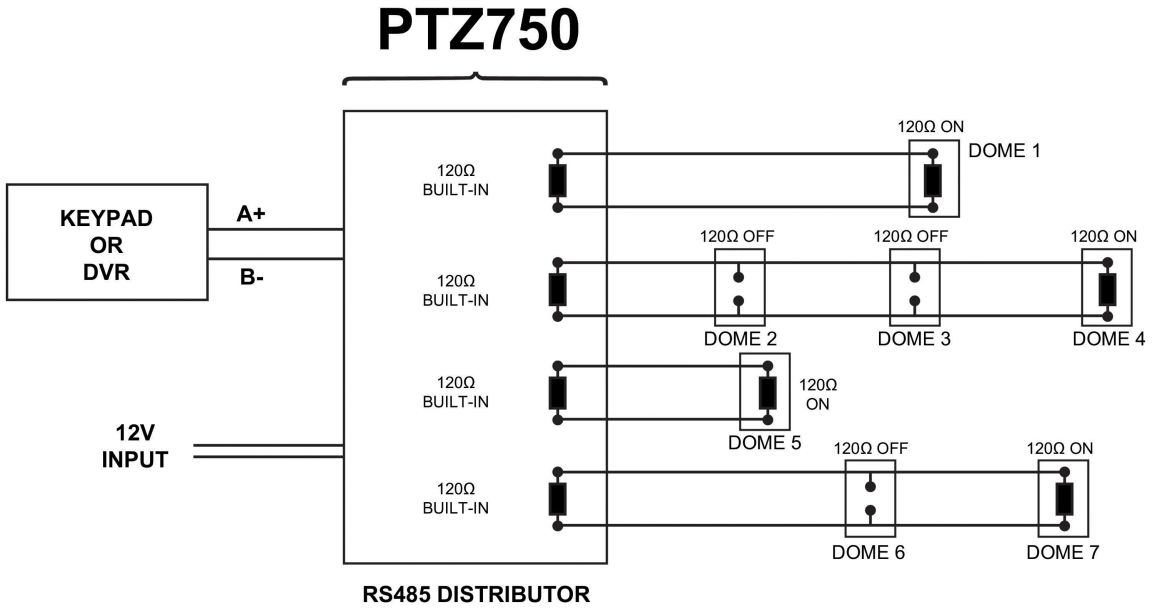
In the real world not everything always works exactly as it's expected to!

RS485 data signals that control the PTZs' movements are tiny signals that can get corrupted for many reasons. Poor cable quality, not using a PAIR of cores from a CAT5 but using one core from TWO separate pairs, running the CAT5 cable near mains equipment such as florescent lighting all will have a detrimental effect on the signal. These are things that you can correct with good installation practices.

Where you wish to run several separate CAT5 cables out to send the RS485 data signal out to the PTZs you are in effect correcting the STAR method of RS485 data distribution. As previously mentioned the problem with the Star method is that it is not actually designed for RS485 but generally works okay if you follow the previous notes on getting the 120ohm resistor setting right, as per the previous notes.

One way that takes the guesswork out of installing the Star method is to utilise an RS485 distributor. This has the advantage that the RS485 signal is correctly distributed to the PTZs so that they behave as expected. You can create up to 4 spurs to the PTZs and put up to 4 PTZs on each spur. Just like the Daisy chain method the end dome on each spur needs to have the 120ohm resistor enabled.

Although the RS485 distributor is a small additional expense, it takes some of the guess work out of the installation design and gives a more flexible approach to cabling which itself can save time and money on the installation. Not forgetting you get more predictable results! The RS485 distributor (PTZ750) amplifies the RS485 control signal and distributes it evenly to 4 separate spurs, each spur can have up to 4 PTZs. This means that you could theoretically have up to 4 individual spurs of over 1000mtrs each to control up to 16 PTZs in total. Ideally you would put just one PTZ on each spur from the PTZ750 but up to 4 PTZs are generally acceptable. The following diagram shows a typical use of the PTZ750 RS485 distributor.



(*Diagram showing how to use an RS485 distributor to improve PTZ control reliability*)

Please note if you have the PTZ750 located within 5mtrs of the keypad or DVR you can connect up to 3 of them in parallel.

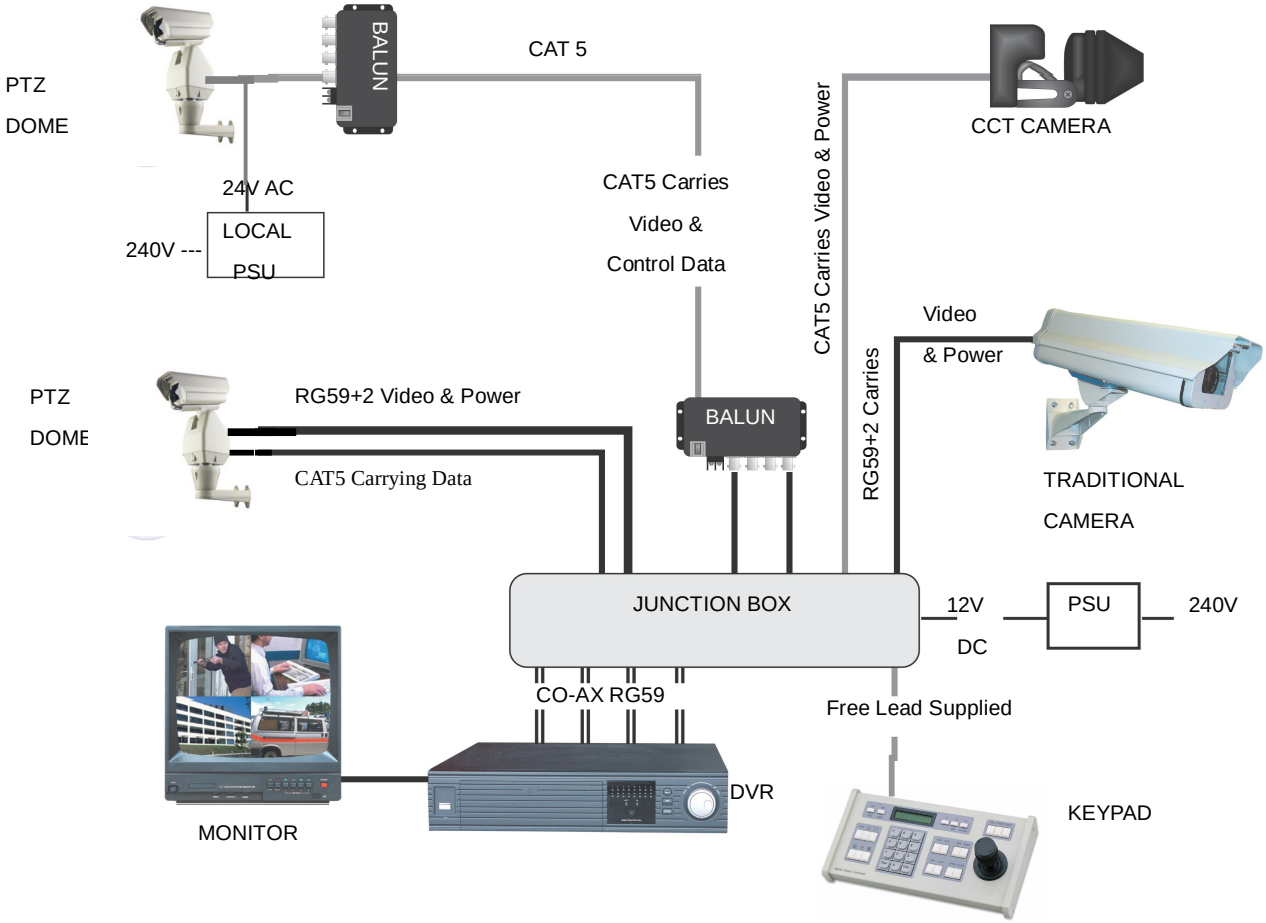
Setting up the PTZ System

1. Connection of the System

There are many ways to wire up a PTZ system.

If you have read the introduction at the beginning of these instructions you should have got a good idea what your options are.

Below is a general schematic diagram showing you some of these options.



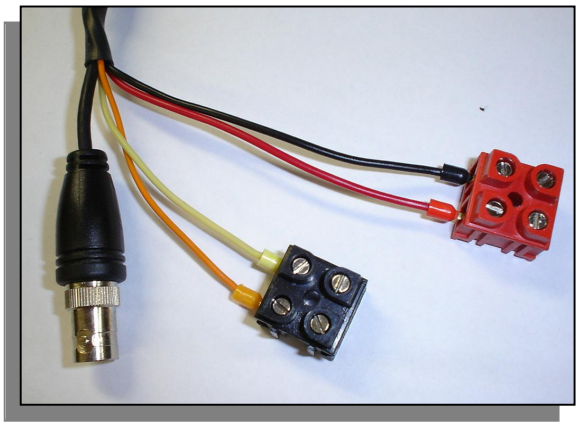
Powering the domes-

All the PTZs will need power. This PTZ head requires a 24V A.C power supply. The power supply must be capable of powering the PTZ Head, the camera to be fitted and possibly the heater in the camera housing. The head provides a 12v DC supply for the camera.

The PTZ Head is rated at 10 watts. Using the formulae Volts x Amps = Watts, the head needs 417 m/A. A suitable 12v camera could take up to 400 m/A without Infra Reds and a heater in a standard heated housing could draw up to 500 m/A. The total current could therefore be in the region of 1.5 Amps.

Please note - The PTZ's heater doesn't come on until it senses the temperature drops below 0 degrees Celsius. At this point the PTZ will need up to 1.5A @ 24V A.C to operate. Please make sure that you have a sufficient power supply and cable installed to cope with this. Obviously the dome may work okay in the summer but when winter kicks in and the PTZ's current draw jumps to 1.5A, an inadequate power supply or a cable with too much voltage drop may stop the PTZ from working properly. When winter comes don't be suddenly caught off guard when your customer rings you to say the PTZ has suddenly packed in because it's gone cold!!

A popular way to power the PTZ is using our COMPOSITE VIDEO cable (or shotgun as its also known) as this cable can carry the power to the dome and the video signal back to the monitor or DVR.



The power connection

The RED & BLACK cable coming out of the dome connected to the RED terminal block are for power. Connect a suitable 24V A.C power supply to this pair of cores.

The BNC connector is the "VIDEO-OUT" from the camera and goes to the monitor or "VIDEO-IN" of a DVR camera input.

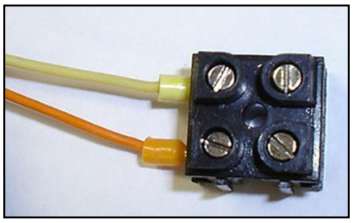
The Orange and Yellow pair of cores that go into the BLACK terminal block are the data cables. These are the cores that carry the RS485 control signal to the dome from either the keyboard or the DVR. The next section of the instructions gives more detail on how to connect the RS485 data. Please also read the RS485 WIRING METHODS & TIPS section towards the beginning of these instructions.

RS485 connection - *Connecting the Keypad or DVR to the PTZ.*

The PTZ head is controlled by an RS485 data signal that is given by either a KEYPAD or a suitable DVR. This data signal tells the PTZ head to pan or tilt. Its important that you read the early section of these instructions to understand the fundamental principle of RS485 cabling techniques so that you get it right.
RS485 has two cores, A and B or sometimes known as RS485 + (A) and RS485 – (B) if you get these two the wrong away around then you will not be able to control the PTZ. Sometimes installers get the connections right on one PTZ but not on the other and find only one PTZ works. They then swap the wires around at the keyboard only to find out one PTZ has now burst into life and the other one now failed!! But they don't put 2 + 2 together and realise their mistake that they have wired one PTZ different to the other. Take great care getting these the right way around and make sure you wire each PTZ IDENTICALLY so that if you have to swap the A & B lines over at the keyboard you know all PTZs are wired the same!!

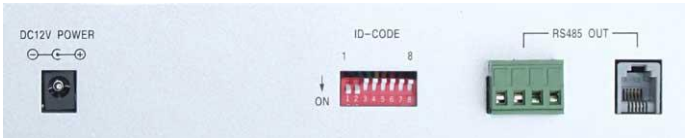
The PTZ800 series adopts the following RS485 convention:

ORANGE = RS485 + or A
YELLOW = RS485 – or B



The PTZ730 and PTZ700 are two keypads that can be used with the PTZ800 series. On the rear of the keypads you will see the RS485 connections. Ensure they are connected correctly i.e the RS485 + A line and the RS485 – B line. Note that both these keypads need to be set to the same protocol as the PTZ dome. Refer to the relevant keypad instruction manuals on the keypad dipswitch settings.

PTZ730 keypad



Rear of PTZ730

RS485 connections

PTZ700 keypad

Rear of PTZ700

RS485 connections

If you use cores from two different pairs in the CAT5 cable you will not get the benefit of the shielding effect of the cable twists and the PTZ will function erratically. You must always use a core from a PAIR, not two cores from two different pairs!!

Connecting the video out of the PTZ Head.

The PTZ Head has a short BNC lead attached to it, this is the lead that carries the video signal from the built-in camera. You need to extend this lead to the “VIDEO-IN” of the DVR or monitor. Use a good quality RG59 coax cable or similar to do this.

TIP – If you can’t get a picture at the remote end you could always take your test monitor to your PTZ and check the picture quality on its own short BNC lead.

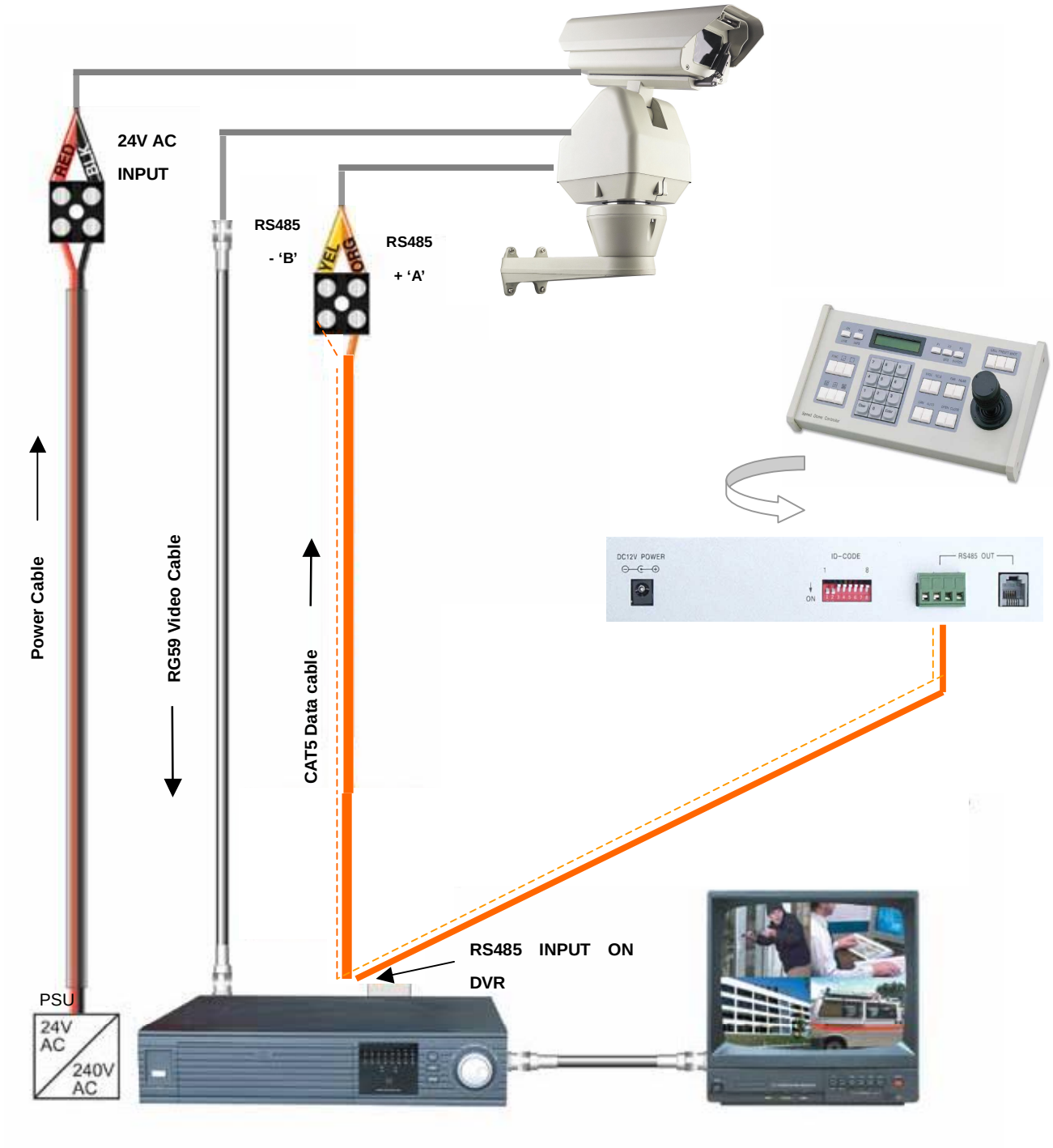
If you’re testing the equipment on a workbench you now have a one PTZ system.

For setting up the keyboard and testing the PTZ please read sections on default PTZ settings and using the keyboard.

You can use a keyboard or a suitable DVR to control the PTZ. A suitable DVR would be one with PTZ functionality built into it and preferably Pelco-D protocol. If your DVR has a list of protocols it’s always best to try “Pelco-D” first or “JEC” protocol, as these are very widely available. In the DVR, with either Pelco-D or JEC set, you must also make sure you set up the “baud-rate” to 2400. JEC protocol is very similar to Pelco-D but has a wider tolerance.

A typical site installation would look like the following diagram on the next page.

It shows a PTZ connected to the keypad plus how the PTZ could also be connected to a DVR instead of the keypad or at the same time. DVR’s that have the capabilities of PTZ control will have a terminal or connection on them somewhere, where the PTZ’s RS485- A and RS485- B line can connect to. Please refer to the individual DVR instructions of how to do this.


24V AC
INPUT
RED
BLK
RS485
- 'B'
RS485
+ 'A'
YEL
ORG
Power Cable
RG59 Video Cable
CAT5 Data cable
DC12V POWER
ID-CODE
RS485 OUT
ON
RS485 INPUT ON
DVR
PSU
24V
AC
240V
AC

If you're using more than one PTZ on a site

Each PTZ has a unique "address" so that if you are using more than one on a site the keyboard "talks" to the right PTZ when you want it to pan, tilt or zoom. If you only have the one PTZ on the site then the default "address" of "1" is okay and you have no reason to change the PTZ from this.

With multiple PTZ sites you need to set up each PTZ address separately.

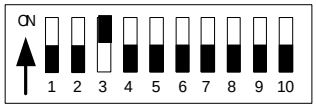
The following diagram shows the switch options.

The following table indicates how this is done.

Speed Dome Address=1

Speed Dome Address=2

Speed Dome Address=3



Speed Dome Address=4

Speed Dome Address=18

DIP-10 is used to set the 120ohn termination resistor.

Dome Address	ID-CODE Status									
	DIP-1	DIP-2	DIP-3	DIP-4	DIP-5	DIP-6	DIP-7	DIP-8	DIP-9	DIP-10
1	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
2	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
3	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
4	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
5	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
6	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
7	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF
8	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
9	ON	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
10	OFF	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
11	ON	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
12	OFF	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
13	ON	OFF	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
14	OFF	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
15	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
16	OFF	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
17	ON	OFF	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
18	OFF	ON	OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF
…	…	…	…	…	…	…	…	…	…	…
511	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF

Table 1

2. **Setup of the Protocol and the Default Baud Rate.**

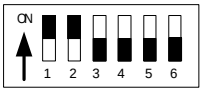
As shown in Table 2, SW2 is used to set the protocol of communication and the baud rate used by the dome camera. DIP-4 to DIP-1 of SW2 is used to select protocols and a maximum of 8 different protocols can be selected. Pelco-D 2400 is used for most System Q equipment.

PELCO D 2400Bps 

Protocols	DIP status				Normal Baud Rate	
	DIP-1	DIP-2	DIP-3	DIP-4	DIP-5	DIP-6
SAMSUNG	ON	OFF	OFF	OFF	OFF	ON
B01	ON	OFF	OFF	OFF	OFF	ON
PELCO-D	ON	ON	OFF	OFF	OFF	OFF
PELCO-P/4800	OFF	OFF	ON	OFF	ON	OFF
PELCO-P/9600					OFF	ON
Longcomity	OFF	ON	ON	OFF	OFF	ON
HUNDA600	ON	ON	ON	OFF	OFF	ON
LILIN	OFF	OFF	OFF	ON	OFF	ON
ALEC	OFF	ON	ON	ON	OFF	ON

Some protocols and the states of the coding switches of normal baud rates of these protocols are shown as follows:

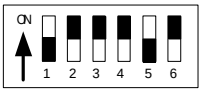
PELCO-D/2400Bps



PELCO-P/4800Bps

PELCO-P/9600Bps

ALEC/9600Bps



Setup of the Baud Rate of Communication.

SW2 is used to set the protocol of communication and the baud rate used by the dome camera. DIP-6 and DIP-5 of SW2 are used to select the baud rate of communication and 4 different baud rates can be selected in maximum. If the controller adopts a non-standard baud rate, you can adjust it to be identical with that of the controller, as per the following table.

Baud Rate of Communication	DIP-1	DIP-2	DIP-3	DIP-4	Setup of Baud Rate	
					DIP-5	DIP-6
2400bps					OFF	OFF
4800bps					ON	OFF
9600bps					OFF	ON
19200bps					ON	ON

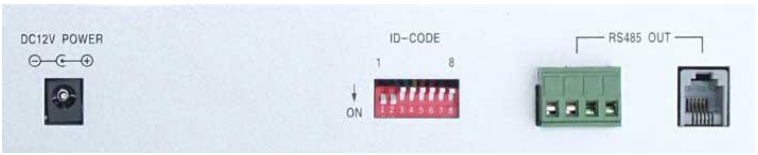
Using the PTZ730 keypad with the Build It Yourself PTZ range

PTZ730 keypad

NOTE 1: For more detailed instructions in setting up the keypad or using one of our other keypads, please refer to the instruction manual supplied with the product.

NOTE 2: The PTZ730 keypad requires you to press the function key first followed by the value e.g <**CAM**> **01** <**Enter**> whereas some keypads e.g PTZ700 require the value first, then the function e.g **01** <**CAM**> <**Enter**>

When you first take the keyboard out of the box you will need to set it up for the PTZs that you are using.
The PTZ you have purchased has the default settings of; **PELCO-D 2400-BAUD rate Address 1**



Rear of PTZ730 keypad

First read through the keypad instruction manual supplied. Set the protocol and baud rate in the keypad using the dipswitches on the rear of the unit. Note that all PTZs controlled by this keypad must have identical protocol and baud rate settings. The manual supplied with the keypad will show you what these settings should be.

Next connect the RS485 connections from the PTZ ensuring that the A and B lines are connected correctly.

Finally connect the power supply. Both the PTZ730 and PTZ700 keypads require a 12V DC PSU (500mA minimum). It is recommended to use a POW800 for this purpose. Now press the keypad ON button.

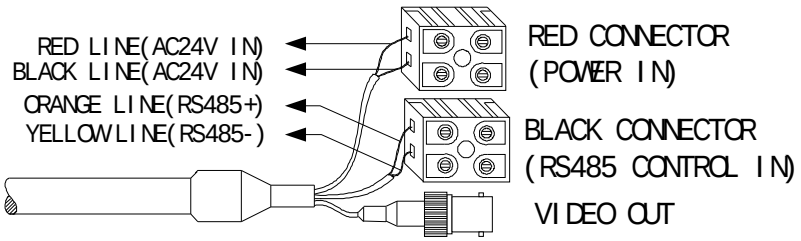
Select a PTZ camera by pressing CAM button followed by camera address and Enter*. The LCD display will indicate the camera channel selected. CAM 01 indicates that the keyboard is ready to talk to camera with address 1, if you have another PTZ set at camera address 2, press CAM button followed by 02 and Enter. This would change the display screen to CAM 02.

If you have multiple PTZs you will need to change the address of each PTZ so they are different but PLEASE LEAVE THE PTZs ON PELCO-D 2400 BAUD RATE.

* see NOTE 2 above.

PRESETS and other functions.

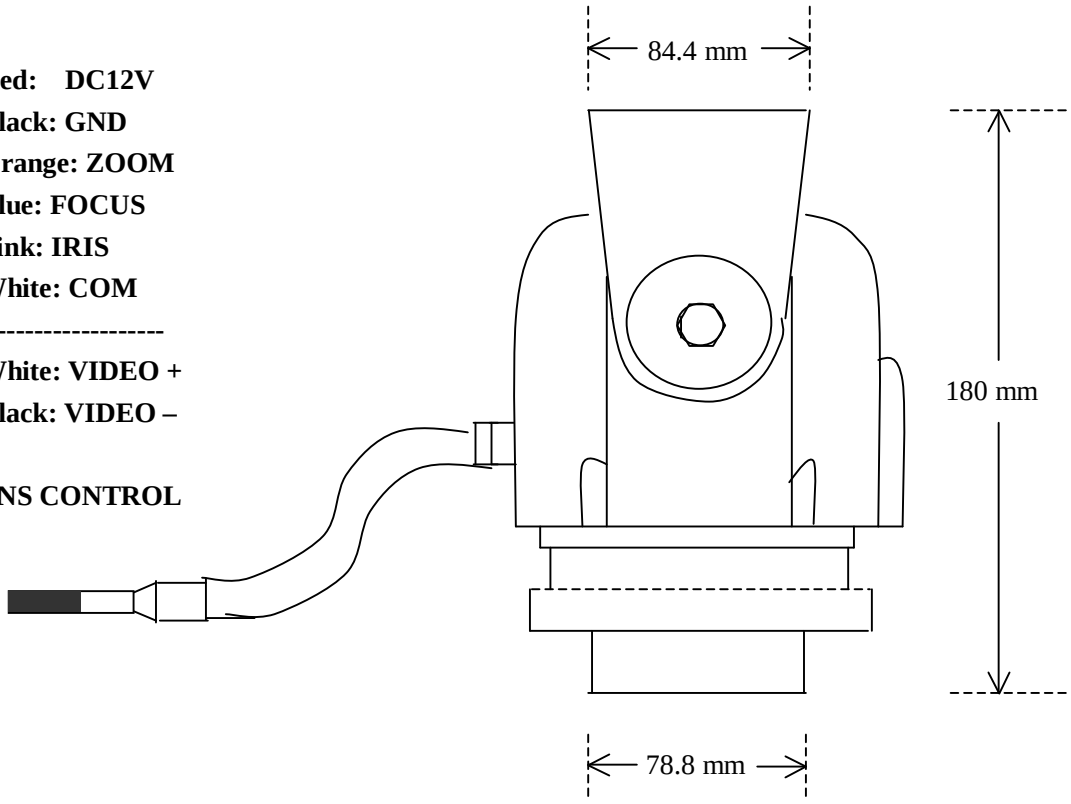
This PTZ Head has no presets or other programmable operations. The unit provides basic manual control facilities only.



- **Red: DC12V**
- **Black: GND**
- **Orange: ZOOM**
- **Blue: FOCUS**
- **Pink: IRIS**
- **White: COM**

- **White: VIDEO +**
- **Black: VIDEO –**

LENS CONTROL



Technical data table

Power Supply	24V AC
Power Consumption	417 mA / 10W
Pan Speed	5° per second
Pan Range	355°
Tilt Speed	5° per second
Tilt Range	-50° ~ +50°
Weight	2 Kgs
Maximum Load	6 Kgs
Control Mode	RS485
Protocols	9 protocol settings
Termination Resistor	Dipswitch 10 on SW1 sets 120ohm termination
Baud Rates	2400 / 4800 / 9600 / 19200
Use	Internal / External in waterproof housing
Humidity	10% to 90% Relative Humidity
Ambient Temperature	-35°C ~ +55°C

Appendix A: General Information

Troubleshooting

1. To avoid problems and to ensure the PTZ has been correctly setup it is always advisable to test the equipment in your workshop before you go on-site. If workshop setup is successful, any problems experienced on-site will be greatly minimized.

2. Always read these instructions before you connect the equipment to any power supply and check that you are using the correct rated power supply and voltage. Never connect non-regulated power supplies.

1. If you are having problems with no video, power the PTZ and plug the video cable direct into your monitor. If still no video then check if PTZ is running the initial self test. If not check power to the PTZ, cables and connections. Remember that every PTZ is tested before despatch to you so it will be very unlikely to be a faulty PTZ unit. Note that video loss can occur on a long cable run, or loss of signal strength resulting in no video, poor quality video or even video in black and white mode. Ensure the termination dipswitch is correctly set in the PTZ dome head. This is accurately detailed in this instruction manual.

4. If video is okay but the telemetry is not working then check the dipswitch settings in the PTZ agree with the settings in the control unit i.e keypad or DVR. The dipswitches set the protocol, baud rate and PTZ address. Ensure that the RS485 cable connecting the PTZ to the control unit is connected the right way around.