T-POV Systems

Bidirectional High Definition

Robotic Camera Link

User Manual

Covers 301 & 324

Base and Camera Unit Versions of the T-POV

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About this User Guide

This T-POV Bidirectional Robotic Camera Link System can be delivered in a number of configurations depending on the physical package selected. This user guide is designed to cover each of the various packages and so not every page in this guide will apply to your specific system.

Throughout this guide a number of informational pointers are used to mark important or useful information.

	Caution – the information provided is important safety information and should be understood and followed in order to operate the T-POV Robotic Camera Link System safely and properly.
	Useful information regarding the User Guide and the T-POV Robotic Camera Link System. Reading and understanding this information will make using the manual and the product easier.

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Chapter 1. Important Information

1.1 Warranty

LIMITED WARRANTY STATEMENT

Belden Inc. expressly warrants to Buyer that the Products supplied shall be free from defects in materials and workmanship for a period of 12 months following the date the Products are delivered to Buyer (the "Warranty Period"). Belden's liability under this limited warranty shall be limited, at its option, to providing refund of purchase price for Products, or replacing or repairing Products shown to be defective either in materials or workmanship. Buyer's sole and exclusive remedy for breach of warranty shall be such refund, replacement or repair.

A claim of defect in materials or workmanship in any Product shall be allowed only when it is submitted in writing to the Telecast Fiber Systems division of Belden Inc. within seven days after discovery of the defect, and in any event within the Warranty Period. No claim shall be allowed in respect of any Product that has been altered, neglected, damaged or stored in any manner which adversely affects it. In order to obtain service under the terms of this warranty, Distributor's customer or Distributor must notify the Telecast Fiber Systems division of Belden Inc. of the defect prior to the expiration of the applicable warranty period and obtain a Return Authorization Number from Belden. In no event may products be returned to Belden or to Distributor for warranty service without having obtained from Belden a Return Authorization Number.

This limited warranty applies only to new and unused Products delivered to Buyers located within the United States of America, or to international Buyers if sold through an authorized Distributor organization, and shall not extend to any equipment not manufactured by Belden Inc., even though such equipment may be sold or operated with the Products. In addition, this limited warranty shall be void and of no further force or effect whatsoever if the Product is repaired or modified by any person other than an authorized representative of Belden Inc. without the consent of Belden Inc. This warranty shall not apply to any defect, failure or damage caused by improper use or inadequate maintenance and care. Nor shall this warranty apply to any damage caused in whole or in part by attempts by personnel other than personnel, as approved in advance in accordance with the foregoing provisions, to open, install, repair, or service the Product; nor to damage resulting from improper connection with incompatible equipment; nor to damage to a unit which has been modified by personnel other than Belden personnel.

Products returned to the Telecast Fiber Systems division of Belden Inc. for warranty service shall be shipped, freight prepaid to the Telecast Fiber Systems division of Belden Inc. Belden will return the repaired product or ship a replacement, freight prepaid, to either Distributor or Distributor's customer, as requested by Distributor's customer, at a location within the United States or, at

Belden's option, to Distributor's location in the case of international sales. This limited warranty shall also apply to Products that replace defective Products and Products that have been repaired by authorized representatives of Belden only for the original Warranty Period. The Warranty Period shall not be extended by reason of defect, or any period of time during which the Product is not available to Buyer because of defects or repairs, without the express written consent of Belden Inc.

EXCEPT FOR THE EXPRESS LIMITED WARRANTY AGAINST DEFECTS IN MATERIALS AND WORKMANSHIP CONTAINED HEREIN, BELDEN INC. MAKES NO WARRANTY OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, AND ALL WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND OTHER WARRANTIES OF WHATEVER KIND ARE HEREBY DISCLAIMED BY BELDEN, INC. THIS LIMITED WARRANTY SETS FORTH EXCLUSIVELY ALL OF BELDEN'S LIABILITY IN CONTRACT OR OTHERWISE IN THE EVENT OF A DEFECTIVE PRODUCT. WITHOUT LIMITATION ON THE FOREGOING, BELDEN, INC. EXPRESSLY DISCLAIMS ANY LIABILITY WHATSOEVER FOR ANY DAMAGES INCURRED DIRECTLY OR INDIRECTLY IN CONNECTION WITH THE SALE OR USE OF, OR OTHERWISE IN CONNECTION WITH, THE PRODUCT, INCLUDING WITHOUT LIMITATION, LOSS OF PROFITS AND SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, WHETHER CAUSED BY NEGLIGENCE OR OTHERWISE, REGARDLESS WHETHER BELDEN INC. HAS BEEN GIVEN ADVANCE NOTICE OF THE POSSIBILITY THEREOF.

THIS WARRANTY IS GIVEN BY IN LIEU OF ANY OTHER WARRANTY EXPRESSED OR IMPLIED.

1.2 Safety and Fiber Optic Systems

Optical Fiber Safety

Never look directly into the end of the optic fiber while either end of the system is operating. Eye damage can result.

Always use cable connector caps when the Fiber Optic cables are not connected. This protects the connector from damage and the unlikely event of exposure to an operating optical link. Keeping the caps in place when the connectors are not in use will prevent dirt and dust from entering the connector and degrading the performance of the optical link

Power Fuses

The T-POV Powered Base Stations are equipped with Dual Cartridge fuses located next to the AC Power receptacle at the left rear of the unit.

NEVER operate a T-POV Powered Base Station without properly installed and rated fuses. Severe electrical and heat damage could result as well as personal injury or death.

1.3 Unpacking the T-POV Robotic Camera Link System

Please consult your packing slip and purchase order to insure that you have received all of the expected Telecast Fiber Systems components.

Inspect all components for scratches and other mechanical damage, and inspect the electrical connectors for bent or damaged pins and latches. Report any missing or damaged components to Telecast Fiber Systems, Inc. See the following section regarding product returns.

You must use your own video and audio cables to make connections for Video, Audio, GPI/Tally, Black Burst/Gen Lock, Base Station monitor, and other ancillary signals and data or control equipment. Suggestions for these cables are discussed later in this document.

Leave the protective caps on the optical connectors whenever the fiber is disconnected.

1.4 Product Returns

In the unlikely event of damage to your T-POV Robotic Camera Link System during shipping or delivery please note the damage with the delivery or shipping service and document the packaging and product where you see damage. If any component does not work correctly out of the box please contact Telecast Fiber Systems service at (508) 754-4858.

If the problem cannot be remedied through a service telephone call an RMA (Return of Merchandise Authorization) will be issued and you will receive an RMA number. Please note this RMA number inside and outside of all shipping boxes and on all documentation provided with the items to be returned.

1.5 Fiber Cable Concepts

Fiber Optics and Fiber Optic Cable are the core technologies at the heart of the Telecast Fiber Systems T-POV Robotic Camera Link System. The ability to multiplex and de-multiplex a variety of video, audio and data signals so that they can be carried over a thin strand of Fiber Optic cable for long distances enables the T-POV System. The theory and operation of Fiber Optics is beyond the scope of this document. What is important for the end user to be aware of the different types of Fiber Optic Cable and Fiber Optic Cable Connectors.

Fiber Optic Cable

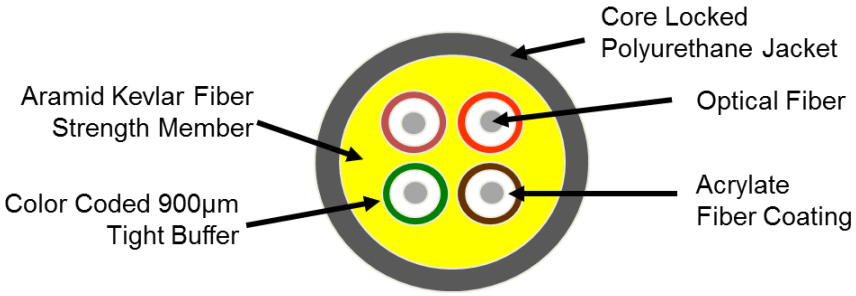


Figure 1 - Tactical Fiber Optic Cable Cross-section (Illustrative only)

Tactical Fiber cable is heavy duty; Kevlar protected and capable of carrying T-POV signals extended distances. The cable can generally withstand a variety of environmental hazards such as being crushed or run-over. When used on Portable Fiber Reels, Tactical Fiber can be used in the field in lengths up to 2000 feet.

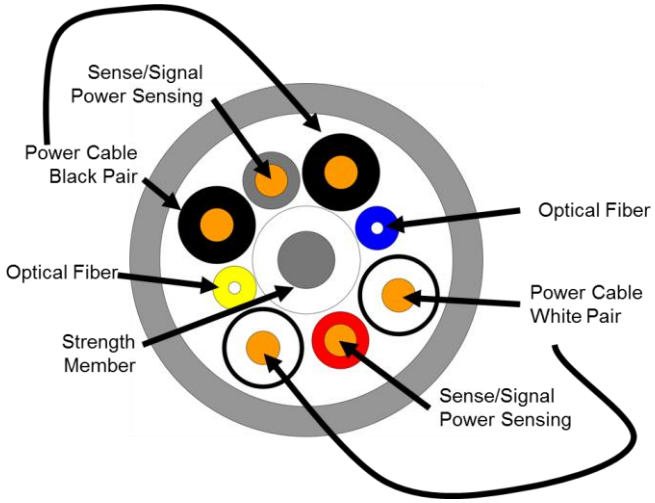


Figure 2 - Hybrid Fiber Optic Cable Cross-section (Illustrative only)

Hybrid Fiber Cable has the same Fiber Optic characteristics with the addition of copper cables. This allows the transmission of power through the cable. This increases weight and reduces operating distance. Hybrid Fiber Cable also includes a pair of Sense/Signal wires that allow systems to determine if there is an open or shorted cable. Hybrid Fiber Cable is also larger in diameter then Tactical Fiber Cable

Fiber Optic Connector Types

The T-POV Robotic Camera Link System is delivered with one of two types of Fiber Connectors. For 12 Volt systems using Tactical Fiber Cable the system is delivered with ST Connectors. For AC Powered Base Unit systems the T-POV is delivered with an SMPTE 304M type hybrid powered fiber connector

Connector Type	Tactical Fiber Use	Hybrid Fiber Use	Camera Unit Use	Base Station Use
Fiber Connectors	**Yes**	**Not Typically**	**Yes**	**Yes**
SMPTE 304M	**No**	**Yes**	**Yes**	**Yes**

Table 1 - Fiber Optic Connector Types & Usage

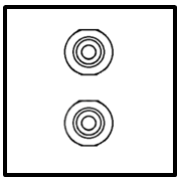
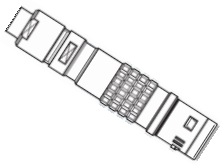
			
ST Cable Connectors	ST Panel Connectors	SMPTE 304M Cable connector	SMPTE 304M Panel Connector

Figure 3 - Fiber Optic Connectors

The specific application of Fiber Optic connectors in T-POV systems is covered in Section 3.1 – Page 23.

Chapter 2. System Overview

This chapter covers the following:

1. T-POV Bidirectional Robotic Camera System concepts
2. T-POV Bidirectional Robotic Camera System Components
3. Signal paths in the T-POV Bidirectional Robotic Camera System

2.1 T-POV Bidirectional Robotic Camera System concepts

The Telecast T-POV Bidirectional Robotic Camera System is a camera video, audio and data multiplexing system that connects to a video camera and through a single fiber optic cable link to a Base Station in a truck, studio or other video production setup. All video, audio and data usually carried on Triax or multi-core cable is sent, bi-directionally, over a single lightweight fiber cable over distances as long as 30 km (18.6 miles) or more. Hybrid cable systems can extend 240 meters (787 feet).

A typical installation controls unmanned robotically controlled cameras used in stadiums, concert halls, high-end surveillance environments, traffic camera sites and permanent weather/beauty shot locations.

The T-POV comes in two variations each providing a specific complement of signals carried on the fiber. Each variation can also be specified to provide power on the Fiber Optic Cable (“Wet”) or without power carrying only the video, audio and data signals (“dry”).

The T-POV variations are the T-POV 301 and the T-POV 324.

The selection of the T-POV model depends on the particular video, audio, data, camera control, tally/GPI and power requirements of each application. Each of the T-POV variations or models can be delivered in either a Rack Unit configuration or Portable “Mini-Mussel” Shell configuration.

In summary, the differences between models depend on whether audio is carried on the Fiber Optic cable and how much and what types of data, control and Tally/GPI information is carried on the Fiber Optic cable. The two models are described in detail later in this user guide and the two physical configurations are explained in the next section.

This illustration provides an example of a Base Station unit working with a single Camera unit. This is one of many possible configurations. Detailed connection information is provided in Sections 6.2 & 6.3 of this User Manual.

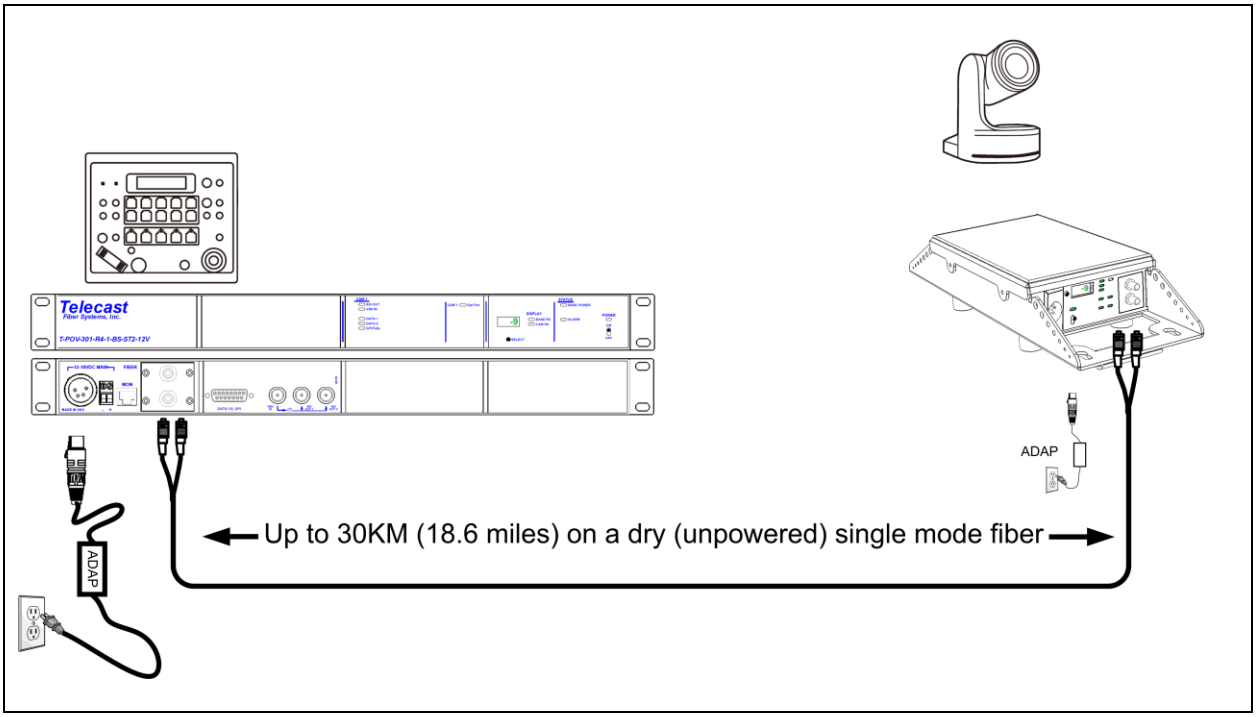


Figure 4 - Example Usage Scenario

In this usage example a camera remote unit is attached to the T-POV base unit and controls a remote camera connected to a T-POV Camera Unit.

The remote camera with controllable pan and tilt unit is connected to the T-POV Camera Unit which is connected to the Base Station over a Fiber Optic Cable. The Base Station is connected to the camera manufacturer's Camera & Pan & Tilt Control unit over a data cable.

Configuration options are determined at the time of product order and the units are delivered pre-configured.

2.2 T-POV Bidirectional Robotic Camera System Components

The T-POV system is comprised of a Base Station and one or two Camera Units.. Any system must consist of Base Station and Camera Units that are of the same model type. A T-POV 301 Base Station will only work with a T-POV 301 Camera Unit. The same holds true for each of the T-POV 324 model. You cannot mix and match a 301 with a 324.

To understand the specific capabilities of the two models please see the following section on Signal Paths in the T-POV and the individual chapters on each model type (Chapters Four and Five).

T-POV Base Station Configurations

T-POV Base Station Variables

The T-POV Base station variations are summarized in the following table. For additional information please see the Ordering Information in Appendix 3 or consult with Telecast Fiber Systems or your Telecast Fiber Systems dealer.

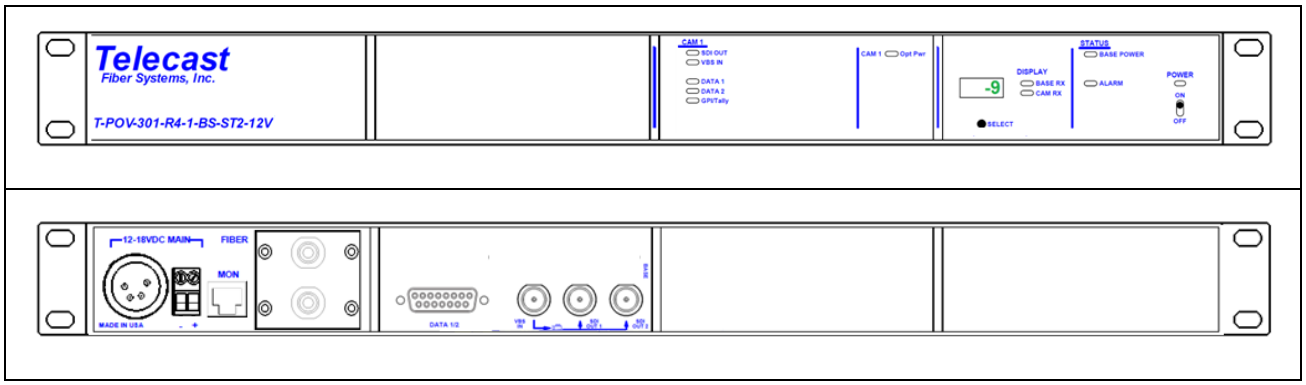
Note that "12V" and "95V" refer to T-POV model types. Both externally powered and AC powered versions of the T-POV provide 12 Volts of power. The powered version additionally provides 95 Watts of 12 Volt power at the Camera Unit for use by the camera and accessories. The power is delivered through a Hybrid Fiber Optic Cable as described in Section 1.5.

Housing	Number of Units	Fiber Connector	Power Option
Single – Mini-Mussel	1	ST1, ST2, SMPTE 304M (powered)	12V "dry" or 95V "wet" (power type dictates Fiber Connector choice)
Rack Mount	1 or 2	ST1, ST2, ST4,	12V "dry"
Rack Mount	1	SMPTE 304M (powered)	95V "wet"

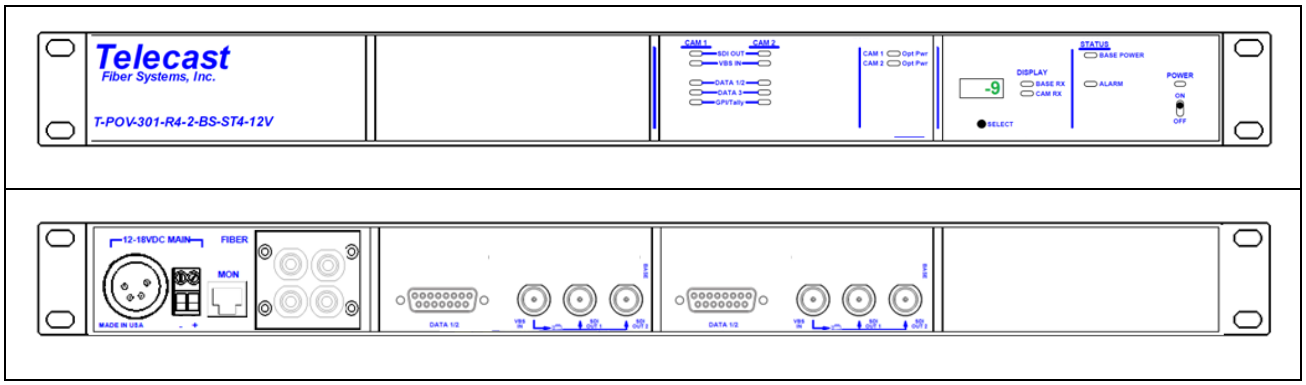
Table 2 -T-POV Base Station Configurations

T-POV Base Station Physical Types

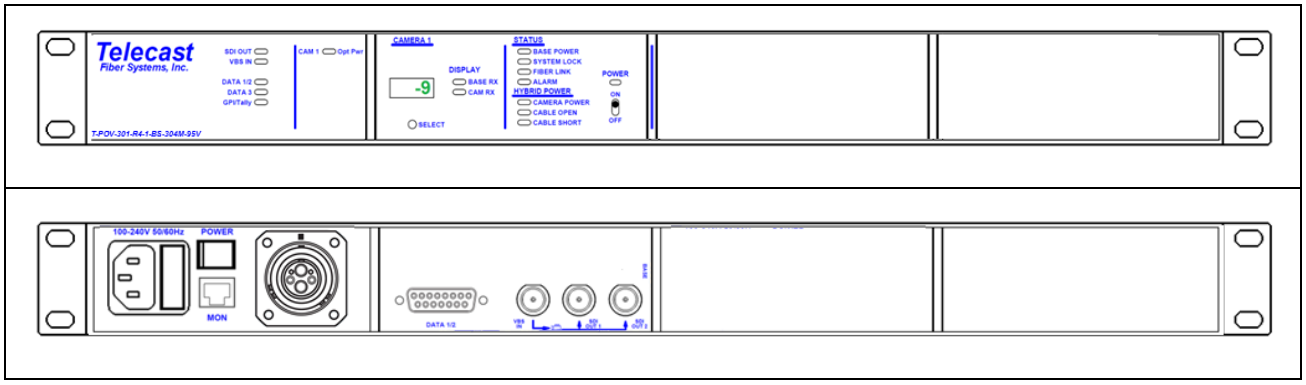
This section illustrates a number of the more commonly specified T-POV Base Station physical types. Not all of the possible configurations are shown. For detailed illustrations of each device please see Chapters Four and Five. See Appendix 3 for a complete list of available T-POV models.



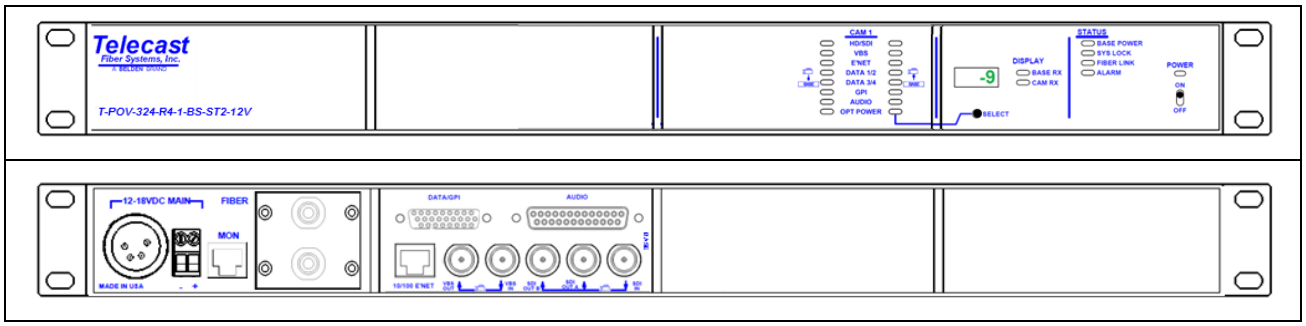
Externally powered T-POV 301 single rack unit with 2 ST Fiber Connectors



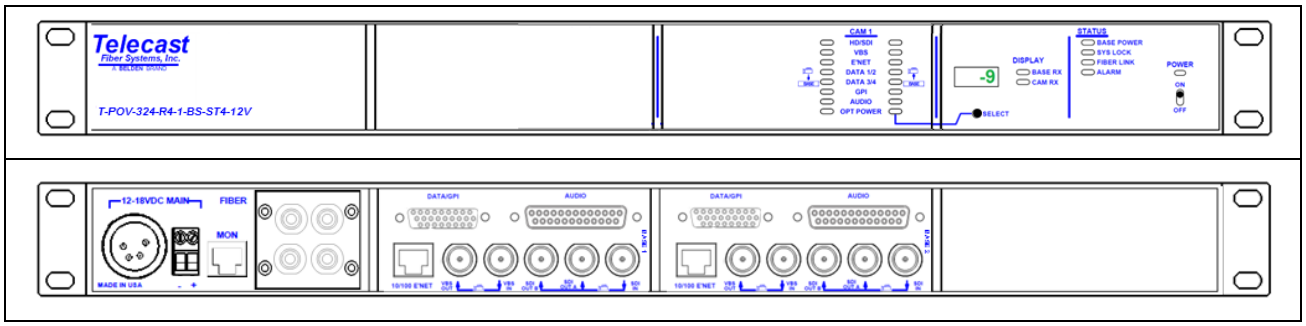
Externally powered T-POV 301 dual rack unit with 4 ST Fiber Connectors



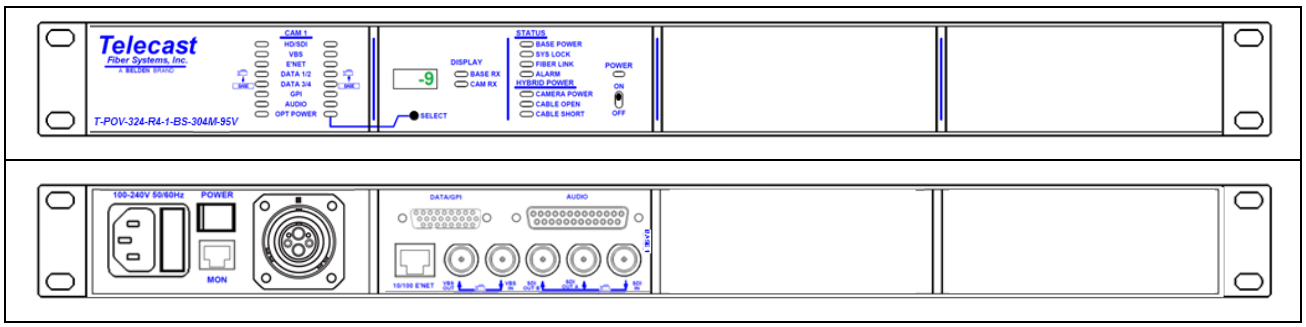
Internally (AC) powered T-POV 301 rack unit with 1 SMPTE 304M Fiber Connector



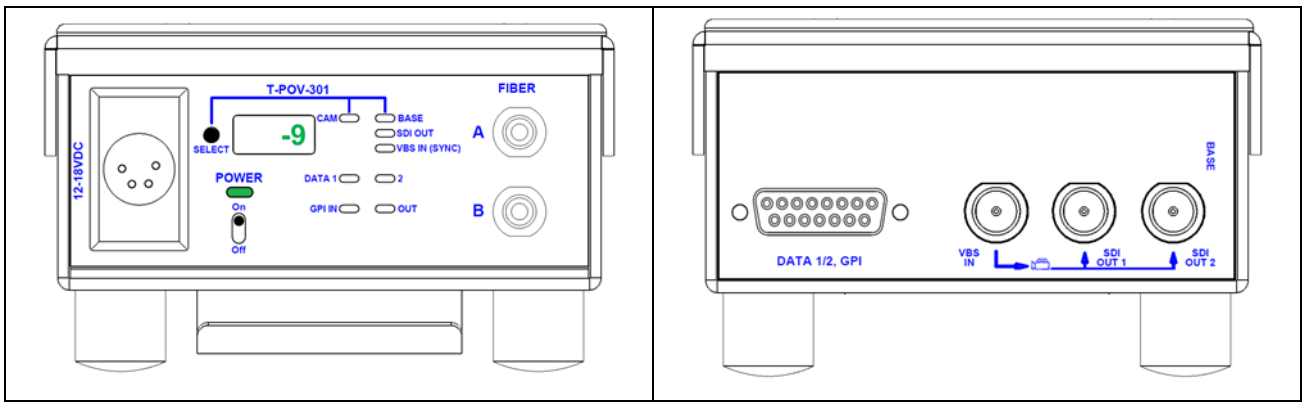
Externally powered T-POV 324 rack unit with 2 ST Fiber Connectors



Externally powered T-POV 324 dual rack unit with 4 ST Fiber Connectors



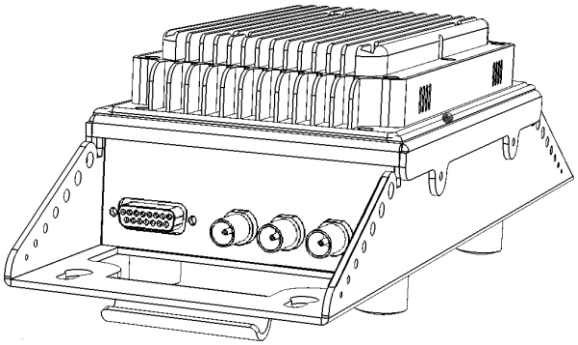
Internally (AC) powered T-POV 324 rack unit with 1 SMPTE 304M Fiber Connector



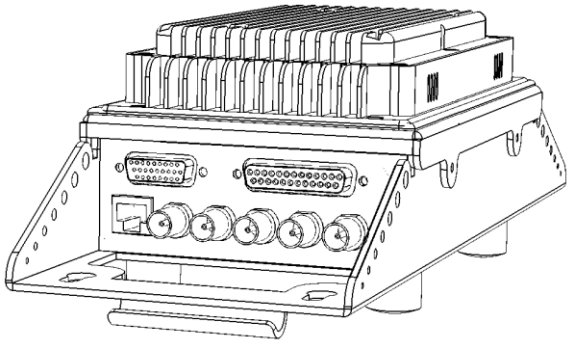
Externally powered T-POV 301 Mini-Mussel unit with 2 ST Fiber Connectors – the T-POV 324 version is similar with additional connectors and LED indicators

T-POV Camera Unit Physical Types

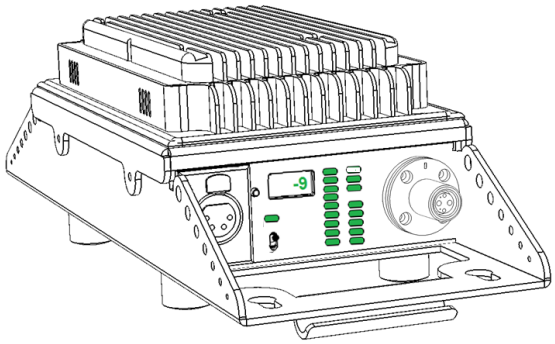
This section illustrates the various Mini-Mussel Shell T-POV Camera Unit physical types. Rack Mount Camera Units are similar to the Rack Mount Base Station physical configurations. System labels are not shown in these illustrations for purposes of clarity. See Appendix 3 for a complete list of available T-POV models. Note the T-POV 324 is used for illustration of the front panel. The T-POV 301 front panel differs only in the number of LED indicators.



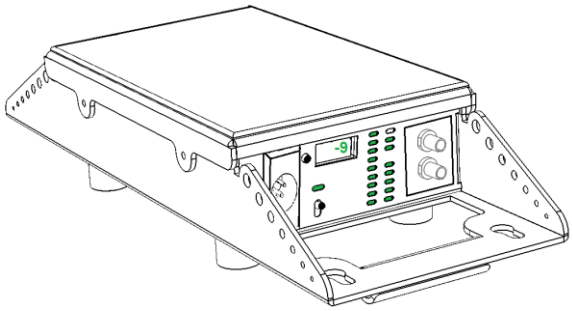
T-POV 301 Camera Unit –Rear Panel



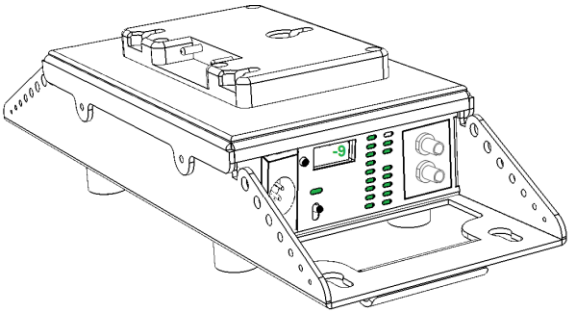
T-POV 324 Camera Unit –Rear Panel



T-POV 324 Camera Unit Front Panel – Internal Power (From Hybrid Fiber Optic Cable)



T-POV 324 Camera Unit Front Panel – External Power



T-POV 324 Camera Unit Front Panel – External Power with Battery Mount Option (Anton-Bauer Battery Mount Shown)

2.3 Signal paths in the T-POV Bidirectional Robotic Camera System

All of the Rack Mount and Mini-Mussel Shell variations of a particular model carry the same signal set whether internally or externally powered.

	Model:	301	324
	CAM ⟷ BASE		
HD/SDI	→	●	●
Return HD/SDI	←		●
VBS	→		●
Return Video or VBS	←	●	●
10/100 Ethernet	⟷		●
RS422/485	⟷	●	
RS232	⟷	●	
GPI /Tally	⟷	●	
RS232/422/485 #1	⟷		●
RS232/422/485 #2	⟷		●
RS232/422/485 #3	⟷		●
RS232	⟷		●
Audio 1 (DB25)	⟷		●
Audio 2 (DB25)	⟷		●
Audio 3 (DB25)	⟷		●
Audio 4 (DB25)	⟷		●

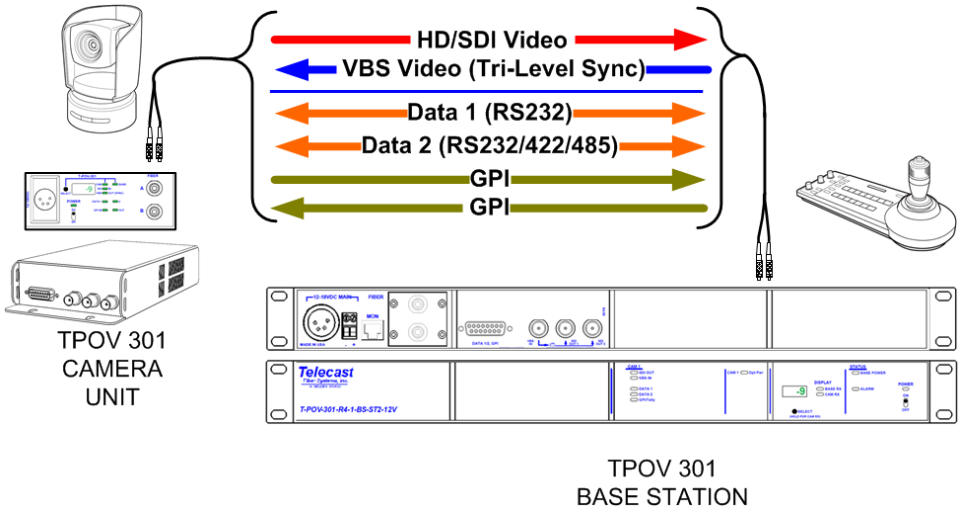


Figure 5 - T-POV 301 Camera Link Signal Paths

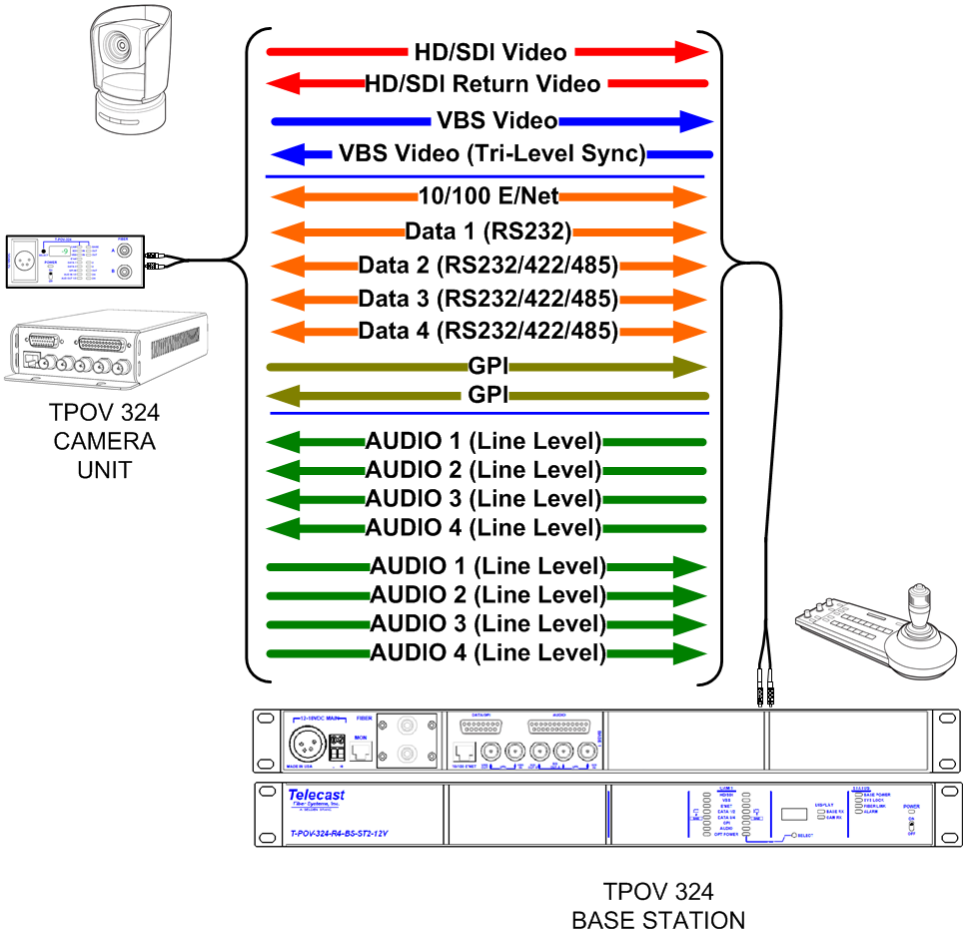


Figure 6 - T-POV 324 Camera Link Signal Paths

Chapter 3. T-POV General Information

This section covers the following information that is applicable to all T-POV Models:

1. Understanding which Fiber Connector is applicable to your T-POV unit
2. Power options with the T-POV – External Power, AC Power and Battery Power
3. T-POV Power Mode and Fiber Connector Compatibility

3.1 Understanding which Fiber Connector is applicable

The selection of Fiber Connector type in the T-POV system is dependent on the following:

1. Is the system an externally powered 12 Volt system or is the system internally powered at the Base Station by 120VAC (note that all AC powered units can be configured for 120VAC or 240VAC operation).
2. What is the number of Link units installed in the base station
3. The choice of Fiber Connectors applies to both models of the T-POV Robotic Camera Link System.
4. See Section 1.5 for a general discussion of Fiber Connectors and see Section 3.3 at the end of this chapter for a detailed list of Fiber Connector and Power Mode compatibility. Powered T-POV Units are delivered with the SMPTE 304M Hybrid Connector. Twelve Volt models use some variation of ST connectors depending on configuration and whether the system has one or two link units installed.

3.2 Power options with the T-POV

The T-POV Robotic Camera Link System has two methods of power for both the Base Station and the Camera Unit. The Base Station can be powered externally by a 12 Volt power supply. Recommended is the Telecast Fiber ADAP-AC-04. The ADAP-AC-04 will work across a 100-240VAC range. The Base Station can also be powered with an internal AC power supply. This power supply provides power to a single Link unit in the Base Station and also provides power down the Hybrid Fiber Link cable to the Camera Unit.

The externally powered Base Station requires only one power supply regardless of the number of Camera Link units installed.

The externally powered Camera Unit can be powered by a 12 Volt Power supply such as the Telecast Fiber ADAP-AC-04. The Camera Unit can also be equipped with a 12 Volt battery mount to provide operation independent of the AC mains or as an on-board power backup. Mounts for Anton Bauer or V-Mount type batteries are available.

Telecast Fiber ADAP Power Supplies

Telecast Fiber Part Number ADAP-AC-04 Supplied with 4PIN XLR/A4F connector

Figure 7 - Telecast ADAP-AC-04 Power Supply

3.3 T-POV Power Mode and Fiber Connector Compatibility

T-POV Base Station Configurations – Chart applies to both models of T-POV

Power Mode	Number of Link Units	Fiber Connector	Notes
External 12 Volt	1	2 ST	
External 12 Volt	1	1 ST	Requires WDM (Wave Division Multiplexing) Unit in order to have bi-directional signals on signal fiber
External 12 Volt	2	4 ST	
Internal AC	1	SMPTE 304M	

T-POV Camera Unit Configurations – Chart applies to both models of T-POV

Power Mode	Fiber Connector
External 12 Volt	1 ST (with WDM)
External 12 Volt	2 ST

Power Mode	Fiber Connector
Internal AC	SMPTE 304M

The following four chapters cover each T-POV model type individually. Please confirm your T-POV model type and proceed to the appropriate Chapter.

Chapter 4 – T-POV 301 – Page 25

Chapter 5 – T-POV 324 – Page 34

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Chapter 4. T-POV Model 301 Robotic Camera Link System Components

The T-POV 301 Robotic Camera Link Base Station and Camera Unit come in both portable and rack mount configurations. In this chapter the system components are described using a single unit rack mounted base station with external 12 Volt power and a standard Mini-Mussel Shell version of the Camera Unit also with external 12 Volt power. The variations for the internally powered Base Station and the powered version of the Camera Unit are described following the 12 Volt versions. Characteristics that are unique to the two link 12 Volt Base Stations are also described. The two link rack mounted Camera Units operate similarly to the two link unit Base Stations.

4.1 .T-POV 301 Base Unit

T-POV 301 Base Unit Overview

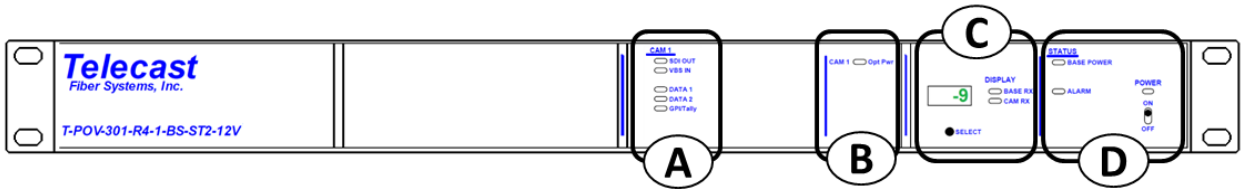


Figure 8 - T-POV 301 Base Station Front Panel

The T-POV Base Station Front Panel has four areas of interest:

A) Signal Indicator LEDs

B) Optical Power Indicator LED

C) Signal Strength & System Setup Display

D) Power/Status Indicators and Power Switch

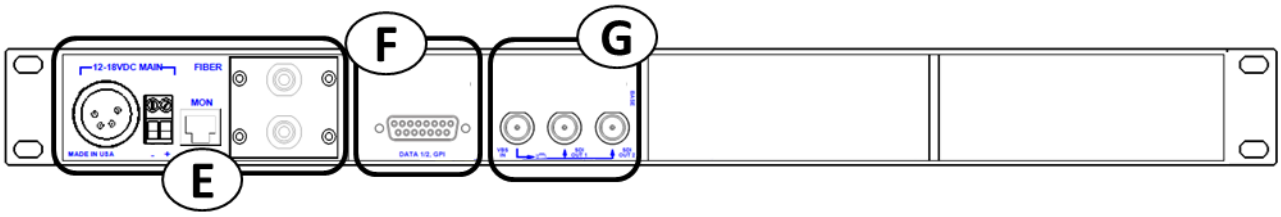


Figure 9 - T-POV 301 Base Station Rear/Connector Panel

The T-POV Base Station Connector Panel has four areas of interest:

E) Power Section and Fiber Connector(s)

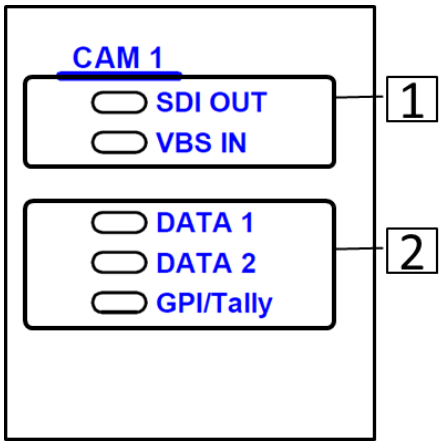
F) Data/GPI-Tally Connector

G) Video Connectors

T-POV 301 Base Unit Front Panel Detail

Area A – Signal Indicator LEDs

The five LED indicators in this area monitor the various signals being sent to and from the Camera Unit. LEDs will glow green when a signal is present.



1) **SDI OUT** – monitors camera video signal returning from the Camera Unit to the Base Station

   VBS IN – monitors the black burst/sync signal or return video signal being sent to the Camera Unit

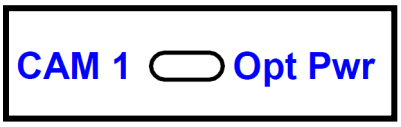
2) **DATA 1** – Monitors data activity on Data Path 1

   DATA 2 – Monitors data activity on Data Path 2

   GPI/Tally – Monitors GPI/Tally signal activity

T-POV Base Unit Indicators

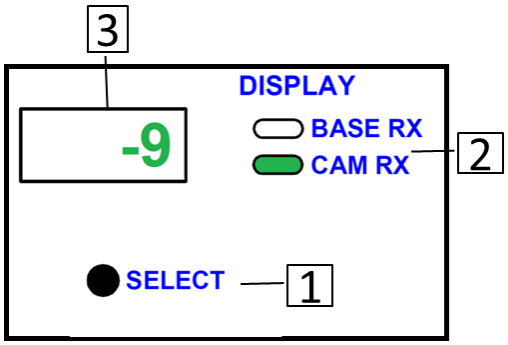
Area B – Optical Power Indicator LED



Opt Pwr – When the LED is lit GREEN, this indicates that the Optical link between the base station and the camera unit is locked and functioning.

The LED will turn RED if there is a problem with the Optical Link at the Base Station. The LED will turn AMBER if there is a problem at the Camera Unit

Area C – Signal Strength & System Setup Display



1) **SELECT** – Push button selects between three modes of operation. When power is turned on the unit defaults to BASE RX display mode

   BASE RX – Indicates display mode is Optical Link signal strength received at Base Station from Camera Unit

   CAM RX – Indicates display mode is Optical Link signal strength received at Camera from Base Station

   DIAGNOSTIC – Indicated by Digital Display showing various alphanumeric readouts – See Section 7.6.

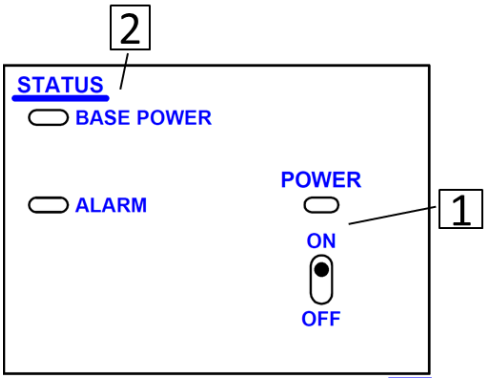
   Note: A sustained push and hold of the SELECT button will enter diagnostics, otherwise a quick push will return to the base station display. Only base station diagnostics appear on the base station; you must be at the camera unit for camera unit diagnostics. The ALARM STATUS LED (see next section) will go AMBER if there is a problem with the Camera Unit.

2) **DISPLAY** – Indicates which unit Optical Link level is being displayed. Neither LED is lit when the unit is in diagnostics mode.

3) **Digital Display** – Indicates Optical Link signal strength in dBm units. Also diagnostic information when Base Station is in diagnostics modes.

   For additional information on both measuring optical link strength and T-POV diagnostics please see Sections 7.5 & 7.6.

Area D – Power/Status Indicators and Power Switch



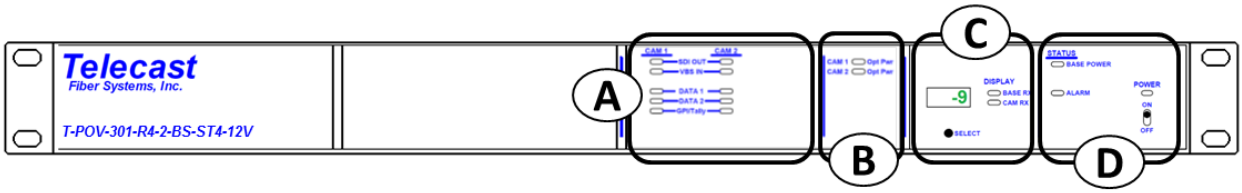
1) **POWER** – Power indicator lights green when the power switch is toggled on. Indicates that power supply levels are good.
2) **STATUS:**

BASE POWER – Indicator monitors power levels on all circuit boards within the Base Station. If any internal power levels are incorrect the LED will go RED.

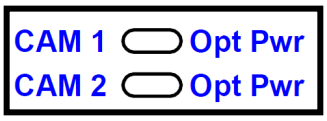
ALARM – Indicator will light RED if there is a temperature, power, hardware or firmware fault in the base unit system. The indicator will go AMBER if there is a fault at the Camera Unit.

T-POV 301 Multiple Unit Detail

The T-POV 301 Multiple Unit Base Station differs from the single unit model in that there are additional LED indicator columns for Camera 2 in **Area A** and additional Optical Power indicators in **Area B**. Component operation differences are noted below.

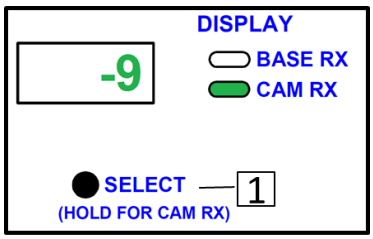


The indicator **AREA A** in the two unit Base Station operates identically to that of a single unit model. The indicator LEDs monitor functions independently of each other.



AREA B – The **Opt Pwr** indicators illuminate as the Select button is toggled through the two Camera Units. The indicators will go RED if there is no optical connection. A Blinking **Opt Pwr** LED indicates that a camera link optical power level is being displayed on the Digital Display in Area C.

AREA D – SELECT button chooses between three modes of operation.

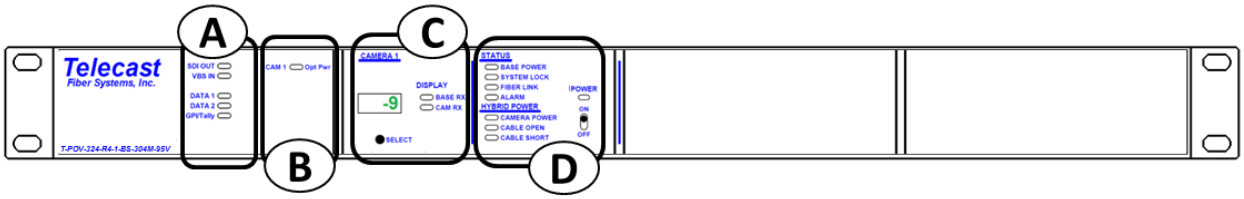


When the Base Station is powered on Base Station optical power is displayed. The first push of the select button will select CAM 1, the second push will select CAM 2.

A sustained push and hold of the SELECT button will enter the diagnostics mode for the device currently being displayed.

T-POV 301 Powered Unit Detail

The T-POV 301 Powered Unit base station is delivered with one Optical Link unit. The physical configuration differs from the 12 Volt model in that the Optical Link unit with its power supply occupies one-half of the rack mount chassis and the Camera 1 unit is placed on the left side of the chassis. The term **Hybrid Power** refers to the integration of 95 Watts of 12 Volt power into the fiber optic cable.



The T-POV Powered Base Station Front Panel has five areas of interest:

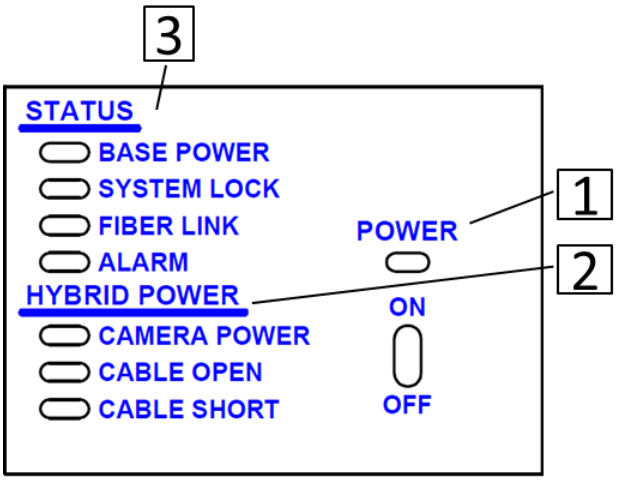
A) Signal Indicator LEDs

B) Optical Power Indicator LED

C) Signal Strength & System Setup Display

D) Power/Status Indicators and Power Switch

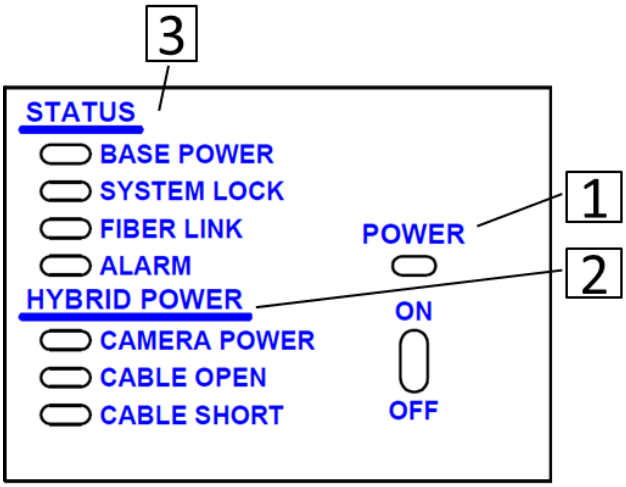
Areas A through C function identically to that of the 12 Volt version of the T-POV Base Station. The differences are in Area D – the Power/Status Indicators and Power Switch.



1) **POWER** – Power indicator lights red when the AC power main switch on the rear of the unit is turned on and the front power switch is off. The indicator lights green when the front panel power switch is toggled on.

With a powered system (power supplied by the Base Station) this switch will control power to the Camera Unit

For the hybrid system to be powered on, the AC Mains switch on the rear of Base Station must be in the on position.



2) HYBRID POWER INDICATORS

CAMERA POWER - indicates that high voltage is applied to power the camera.

GREEN when high voltage is being supplied to the camera.

Off when there is no high voltage applied to the camera

CABLE OPEN - indicates that the high voltage cable is open or there is no high voltage cable connected.

GREEN when the cable is properly connected from the Base Station to the camera.

RED when there no cable connected to the camera or the cable is connected but open.

High voltage will not be applied to the camera until the open condition is corrected.

CABLE SHORT - indicates that the high voltage cable connected is shorted.

3) STATUS INDICATORS

BASE POWER - indicates the status of all power levels in the Base Station

GREEN when all power levels are normal.

RED when any power level is not normal.

SYSTEM LOCK - indicates that the Base Station is communicating with the Camera Unit.

GREEN when communicating with Camera Unit

RED when it is not communicating with the Camera Unit

FIBER LINK - indicates the optical power status of the Base Station and camera

GREEN when both the Base Station and camera optical power are within a normal range.

RED when both the Base Station and camera optical power are not within a normal range

AMBER when either the Base Station or camera optical power are not within a normal range

ALARM - Indicator will light RED if there is a temperature, power, hardware or firmware fault in the base unit system. The indicator will go AMBER if there is a fault at the Camera Unit..

RED if there is a Base Station error. Refer to the Base Station DIAG for details on the error.

AMBER if there is a camera error. Refer to CAM DIAG for details for the error.

T-POV 301 Base Unit Rear Panel Detail

The Base Unit rear panel Area diagram is repeated for reference. In multi-unit Base Stations camera one is on the left next to the power and fiber connector section. Camera two is to the right of camera one and camera three is to the right of camera two (if so equipped).

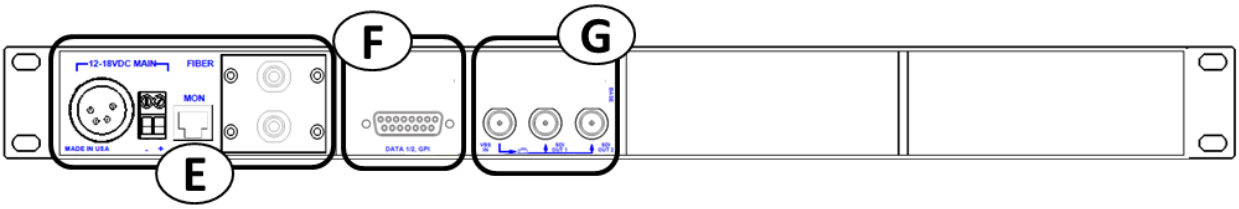


Figure 10 - T-POV 301 Base Station Rear/Connector Panel

The T-POV Base Station Connector Panel has four areas of interest:

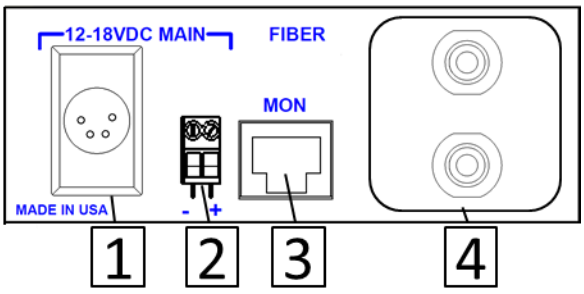
E) Power Section and Fiber Connector(s)

F) Data/GPI-Tally Connector

G) Video Connectors

Area E – Power Section and Fiber Connector(s)

12 Volt models have a single power supply/fiber connection area regardless of the number of Optical Link units configured



<u>12 Volt Power Models</u>

1) 12V DC External Power Supply input connector (XLR 4 Pin) –

   For use with an external power supply such as the Telecast Fiber ADAP-AC-04

   See Appendix 1 for connection details

2) 12V DC Input – terminal block

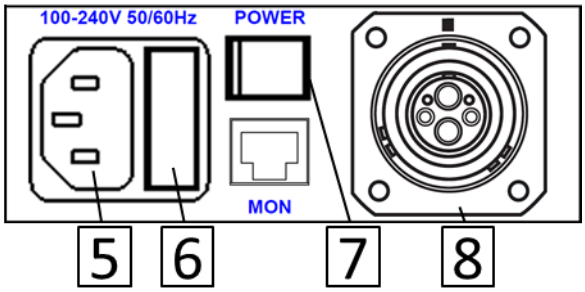
   For use in rack mounted installations as an option to an external "brick" type power supply.

   See Appendix 1 for connection details

3) For Future Use

4) ST Connectors

95 Watt Powered Models



5) AC Power Receptacle

   100-240V 50/60 Hz

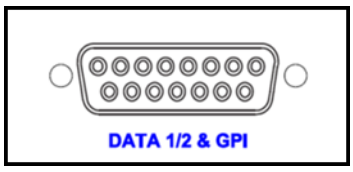
6) 4 AMP Dual Fuse Assembly

   The fuses supplied are standard 4 Ampere fuses – 5 x 20mm. Both fuses are in operation at all times – both the AC Line Hot and the AC Line Neutral are fused. Use Littlefuse 218 or equivalent.

7) AC Mains Power Switch – this must be turned on in order for the front panel power switch to work

8) SMPTE 304M Fiber Connector (Powered)

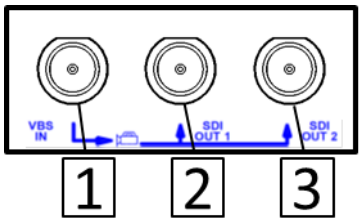
Area F – Data/GPI-Tally Connectors



DATA 1/2 & GPI – Provides up to two bi-directional data feeds and a GPI feed. Available are RS232, RS422 and RS485 data formats.

For configuration and wiring information on all data & GPI connections please see Appendix 1.

Area G – Video Connectors

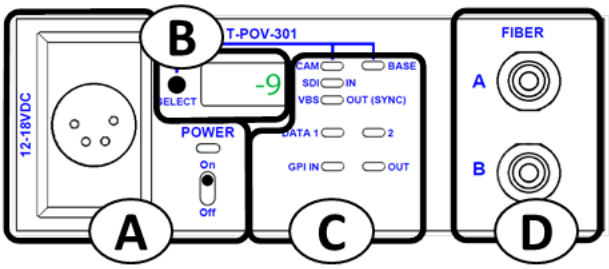


1) **VBS IN** – Video black burst/sync or return video to Camera unit

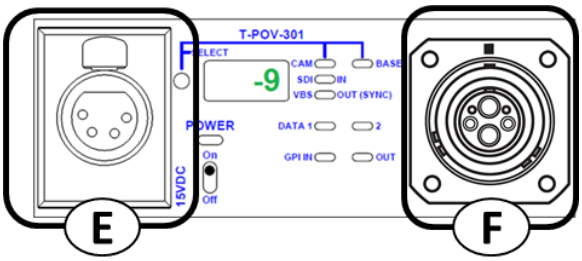
2 & 3) **SDI OUT 1 & 2** – SDI Video signal coming from Camera Unit

4.2 T-POV 301 Camera Unit

T-POV 301 Camera Unit Overview



T-POV 301 12 Volt Version



T-POV 301 Powered Version

The T-POV 301 Camera Unit Front Panel has six areas of interest:

A) Power Section (12 Volt Type)

B) Optical Power Strength and Diagnostic Display

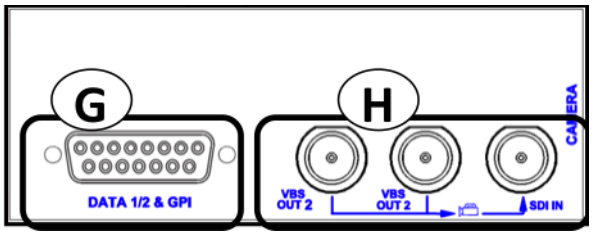
C) Signal Indicator LEDs

D) ST Fiber Connectors

E) 12-15 VDC Power Output (AC Powered Version only)

F) SMPTE 304M Fiber Connector

("Wet" with 95 Watts of 12 Volt power available)



The T-POV 301 Camera Unit Rear Panel has two areas of interest:

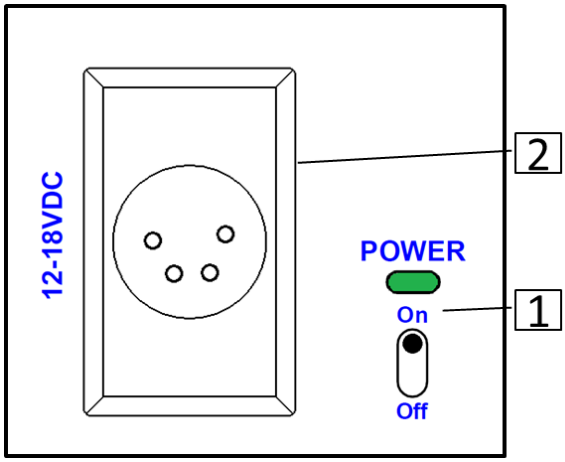
G) Data/GPI-Tally Connector

H) Video Connectors

The T-POV Camera Unit rear panel is identical in the 12 Volt and Powered versions.

T-POV 301 Camera Unit Front Panel Detail – 12 Volt Model

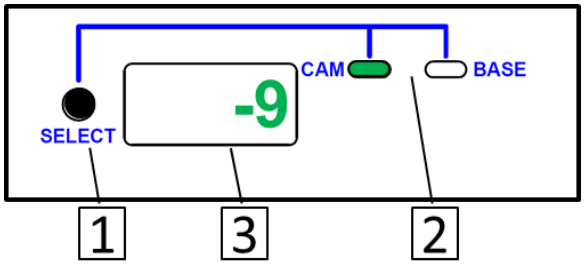
Area A – Power Section (12 Volt Type)



1) **POWER** – Power indicator lights green when the power switch is toggled on.

2) **12-18 VDC Power Connection** – 4-Pin XLR Female chassis connector for use with an external power supply such as the Telecast Fiber ADAP-AC-04 or equivalent

Area B – Optical Power Strength and Diagnostic Display



1) **DISPLAY SELECT –** Push button chooses between three modes of operation

When power is turned on, the Camera Unit optical power is first displayed. The first push of the select button will select the Base Station

A sustained push and hold of the SELECT button will enter diagnostics, otherwise a quick push will return to the camera unit display.

2) CAM/BASE Indicators – LEDs indicate which unit Optical Power is displayed. Neither LED is on when the display is in diagnostics mode.

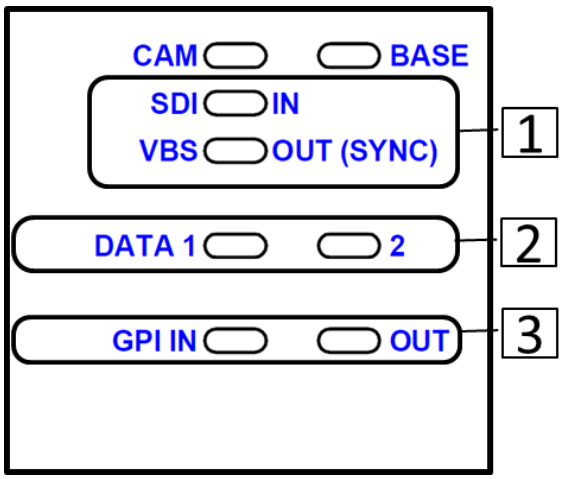
3) DISPLAY – Optical power is displayed in dBm units and diagnostic information is alphanumeric. Only Camera Unit diagnostics can be viewed at the Camera Unit (Base Station diagnostics are not available at the Camera Unit)

For more information on measuring optical power and using system diagnostics please see Section Sections 7.5 & 7.6.

Area C – Signal Indicator LEDs

The eight LED indicators in this area monitor the various signals being sent to or from the Camera Unit. LEDs will glow green when a signal is present.

Note: LEDs labeled "IN" indicate signals coming into the camera unit. LEDs labeled "OUT" indicate signals coming out of the Base Station. If there is neither "IN" or "OUT" associated with an LED then activity in either the Camera Unit and Base Station is indicated



1) **SDI IN** – monitors camera video signal to the Base Station

   VBS OUT (SYNC) – monitors the black burst/sync signal or return video signal being sent to the camera

2) **DATA** - Monitors the two data channels available with the T-POV.

3) **GPI** – Monitors GPI/Tally pulse to and from Camera Unit

Area D – Fiber Connectors – "Dry" Unpowered Connectors

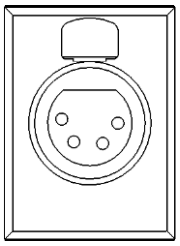
FIBER CONNECTORS – Shown are 2 ST connectors. Can be any available unpowered Fiber Connector depending on user requirements and number of camera units installed**.**

For additional information please see Section 1.5 on Fiber Connectors and Appendix 3 regarding ordering information.

T-POV 301 Camera Unit Front Panel Detail – Powered Model

The T-POV 301 Powered Camera Unit receives power from the Base Station over the Hybrid Fiber Cable connection. The 12 Volt and Powered version of the T-POV 301 operate identically with two exceptions. The powered version provides a 12-15 Volt output for camera and accessory power and the Fiber Connection must of necessity be a Hybrid Fiber Cable connection.

Area E – 12-15 VDC Power Output



12-15 VDC Power Output – Provides up to 95 Watts of 12 Volt power for the camera or accessories.

Please insure that the total power drain on this source is no more than 95 Watts.

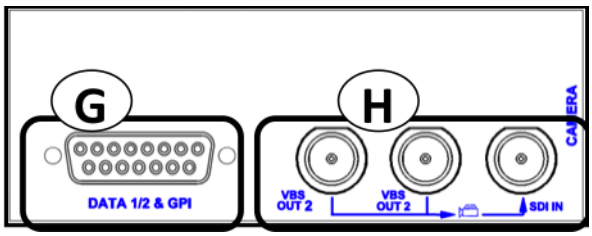
For connector wiring information see Appendix 1.

Area F – Fiber Connector

Fiber Connector – SMPTE 304M Hybrid power fiber connection carries signals to and from the Base Station and 95 Watts of12 Volt power from the base station.

T-POV 301 Camera Unit Rear Panel Detail

The Camera Unit rear panel Area diagram is repeated for reference.



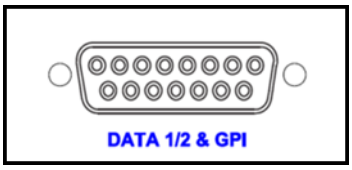
The T-POV 301 Camera Unit Rear Panel has three areas of interest:

G) Data/GPI-Tally Connector

H) Video Connectors

The rear connector panels of all versions of the T-POV 301 Camera Unit are identical in physical configuration and in function.

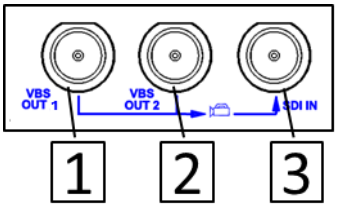
Area G – Data/GPI-Tally Connectors



DATA 1/2 & GPI – Provides up to two bi-directional data feeds and a GPI/Tally connection. Available data formats are RS232, RS422 and RS485.

For configuration and wiring information on all data & GPI connections please see Appendix 1.

Area H – Video Connectors



1 & 2) **VBS OUT 1 & 2** – Video black burst/sync or return video to Camera Unit

3) **SDI IN** – SDI Video signal coming from Camera Unit

Chapter 5. T-POV Model 324 Robotic Camera Link System Components

The T-POV 324 Robotic Camera Link Base Station and Camera Unit come in both portable and rack mount configurations. In this chapter the system components are described using a single unit rack mounted base station with external 12 Volt power and a standard Mini-Mussel Shell version of the Camera Unit also with external 12 Volt power. The variations for the internally powered Base Station and the powered version of the Camera Unit are described following the 12 Volt versions. Characteristics that are unique to the two-link 12 Volt Base Stations are also described. The two link rack mounted Camera Units operate similarly to the two link unit Base Stations.

5.1 T-POV 324 Base Unit

T-POV 324 Base Unit Overview

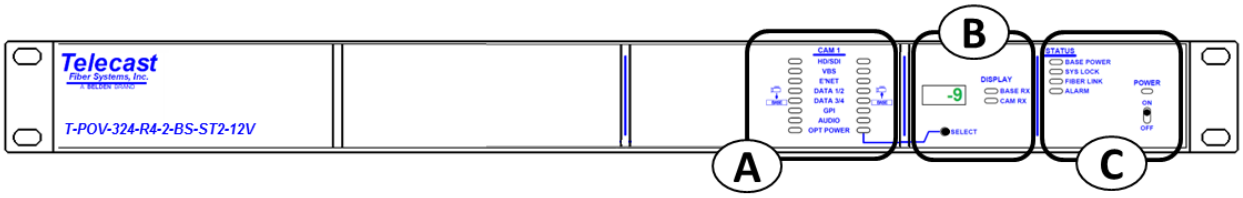


Figure 11 - T-POV 324 Base Station Front Panel

The T-POV Base Station Front Panel has three areas of interest:

A) Signal Indicator & Optical Power LEDs

B) Signal Strength & System Setup Display

C) Power/Status Indicators and Power Switch

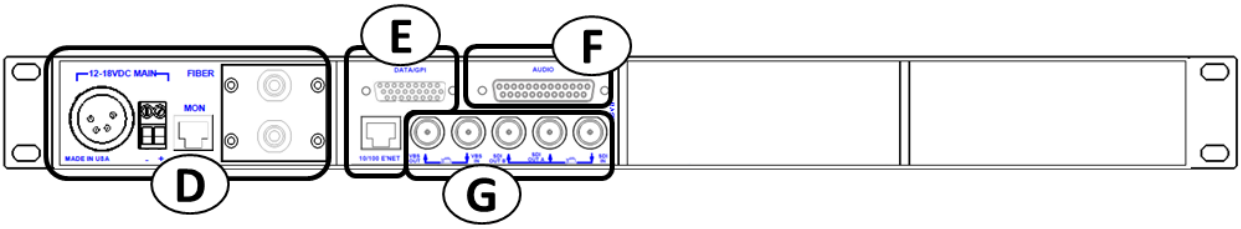


Figure 12 - T-POV 324 Base Station Rear/Connector Panel

The T-POV Base Station Connector Panel has four areas of interest:

D) Power Section and Fiber Connector(s)

E) Data/GPI-Tally/Ethernet Connectors

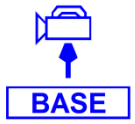
F) Audio Multi-Pin Connector

G) Video Connectors

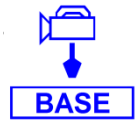
T-POV 324 Base Unit Front Panel Detail

Area A – Signal Indicator LEDs

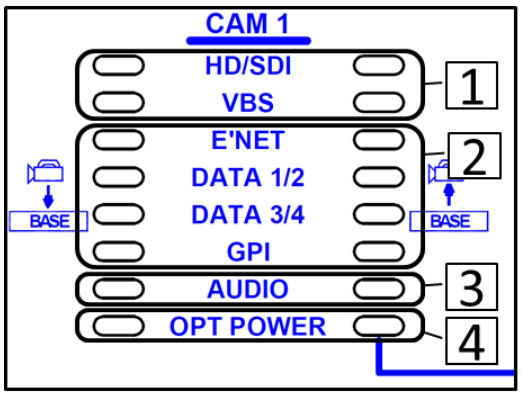
The 16 LED indicators in this area monitor the various signals being sent from the Camera Unit. LEDs will glow GREEN when a signal is present.



Icon indicates signal flow from T-POV Base Station Unit to Camera Unit



Icon indicates signal flow from T-POV Camera Unit to Base Station Unit



T-POV Base Unit Indicators

1) **SDI OUT** – monitors camera video signal returning from the camera unit

   VBS IN – monitors the black burst/sync signal or return video signal being sent to the camera

2) **E'NET –** Monitors data activity on the Ethernet connection

   DATA 1/2 – Monitors data activity on Data Paths 1 and 2

   DATA 3/4 – Monitors data activity on Data Path 3

   GPI – Monitors GPI/Tally signal activity

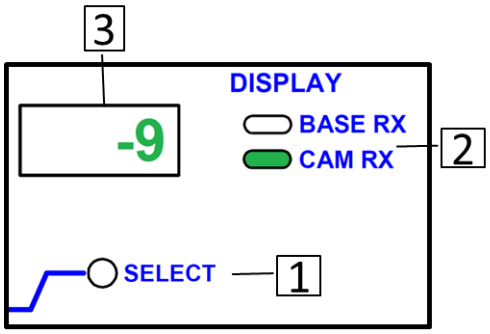
3) **AUD**– Monitors audio activity

   Note: All audio is at line level and signals on any of the four audio channels will activate the LED

   OPT POWER - When the LED is lit GREEN, it indicates that the Optical link between the base station and the camera unit is locked and functioning.

6. The LED will turn RED if there is a problem with the Optical Link at the Base Station. The LED will turn AMBER if there is a problem at the Camera Unit

Area B – Signal Strength & System Setup Display



1) **SELECT** – Push button selects between three modes of operation. When power is turned on, the unit defaults to BASE RX display mode

   BASE RX – Indicates display mode is Optical Link signal strength received at Base Station from Camera Unit

   CAM RX – Indicates display mode is Optical Link signal strength received at Camera from Base Station

   DIAGNOSTIC – Indicated by Digital Display showing various alphanumeric readouts – See Section 9.5.

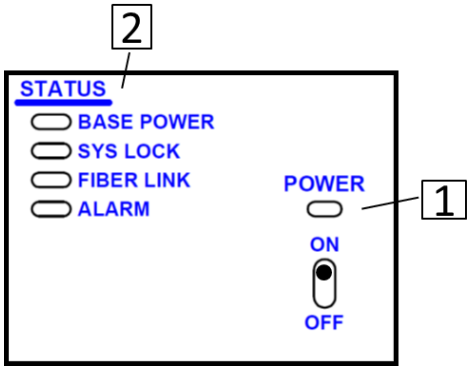
   Note: A sustained push and hold of the SELECT button will enter diagnostics, otherwise a quick push will return to the base station display. Only base station diagnostics appear on the base station; you must be at the camera unit for camera unit diagnostics. The ALARM STATUS LED (see next section) will go AMBER if there is a problem with the Camera Unit.

2) **DISPLAY** – Indicates which unit Optical Link level is being displayed. Neither LED is lit when the unit is in diagnostics mode.

3) **Digital Display** – Indicates Optical Link signal strength in dBm units. Also diagnostic information when Base Station is in diagnostics modes.

   For additional information on both measuring optical link strength and T-POV diagnostics please see Sections 7.5 & 7.6.

Area C – Power/Status Indicators and Power Switch



1) **POWER** – Power indicator lights green when the power switch is toggled on.

2) **STATUS**

BASE POWER - indicates the status of all power levels in the Base Station

GREEN when all power levels are normal.

RED when any power level is not normal.

SYSTEM LOCK - indicates that the Base Station is communicating with the Camera Unit.

GREEN when communicating with Camera Unit

RED when it is not communicating with the Camera Unit

FIBER LINK - indicates the optical power status of the Base Station and camera

GREEN when both the Base Station and camera optical power are within a normal range.

RED when both the Base Station and camera optical power are not within a normal range

AMBER when either the Base Station or camera optical power are not within a normal range

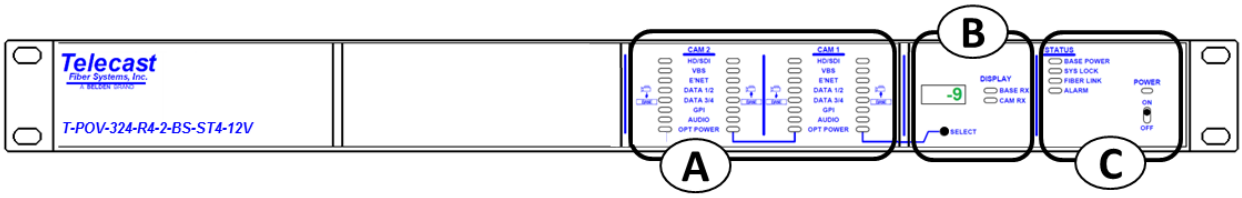
ALARM - Indicator will light RED if there is a temperature, power, hardware or firmware fault in the base unit system. The indicator will go AMBER if there is a fault at the Camera Unit.

RED if there is a Base Station error. Refer to the Base Station DIAG for details on the error.

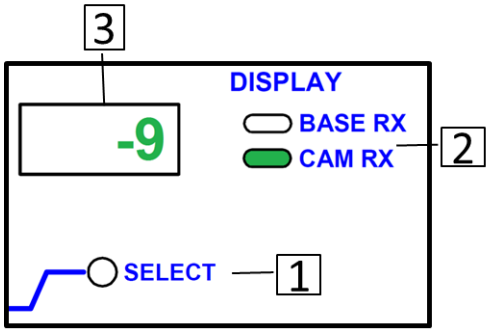
AMBER if there is a camera error. Refer to CAM DIAG for details for the error.

T-POV 324 Multiple Unit Detail

The T-POV 324 Multiple Unit Base Station differs from the single unit model in that there are additional LED indicator columns in **Area A**. Component operation differences are noted below.



The indicator **AREA A** in the two unit Base Station operates identically to that of a single unit model. The indicator LEDs monitor their functions independently of each other.



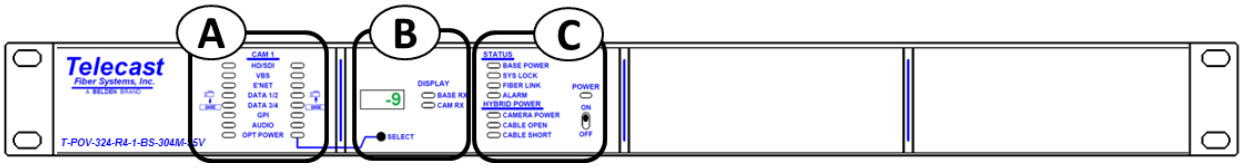
AREA B – SELECT button (1) chooses between three modes of operation and between two or three camera units, depending on how many camera units are installed in the base station

When the Base Station is powered on, Base Station optical power is displayed. The first push of the select button will select CAM 1, the second push will select BASE 1. The third push will select CAM 2, the fourth push will select BASE 2.

A sustained push and hold of the SELECT button will enter the diagnostics mode for the device currently being displayed.

T-POV 324 Powered Unit Detail

The T-POV 324 Powered Unit base station is delivered with one Optical Link unit. The physical configuration differs from the 12 Volt model in that the Optical Link unit with its power supply occupies one-half of the rack mount chassis and the Camera 1 unit is placed on the left side of the chassis. The term **Hybrid Power** refers to the integration of 95 Watts of 12 Volt power into the fiber optic cable.



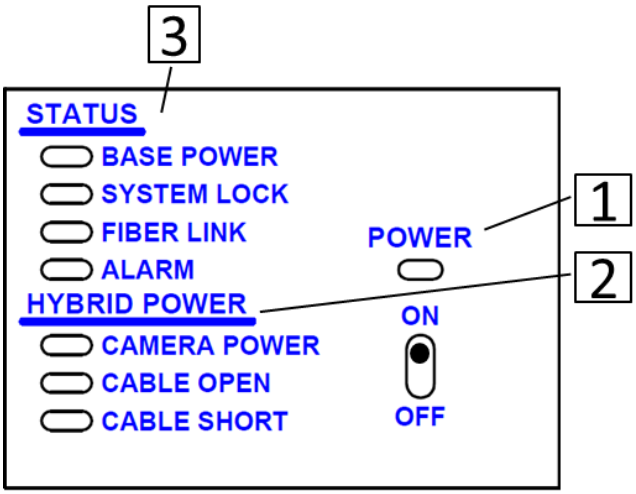
The T-POV Powered Base Station Front Panel has four areas of interest:

A) Signal Indicator LEDs

B) Signal Strength & System Setup Display

C) Power/Status Indicators and Power Switch

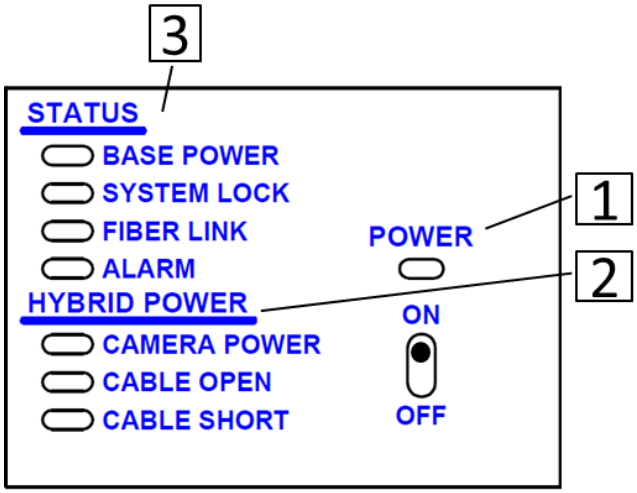
Areas A and B function identically to that of the 12 Volt version of the T-POV Base Station. The differences are in Area C – the Power/Status Indicators and Power Switch.



1) **POWER** – Power indicator lights red when the AC power main switch on the rear of the unit is turned on and the front power switch is off. The indicator lights green when the front panel power switch is toggled on.

With a powered system (power supplied by the Base Station) this switch will control power to the Camera Unit

For the hybrid system to be powered on, the AC Mains switch on the rear of Base Station must be in the on position.



2) HYBRID POWER INDICATORS

CAMERA POWER - indicates that high voltage is applied to power the camera.

GREEN when high voltage is being supplied to the camera.

Off when there is no high voltage applied to the camera

CABLE OPEN - indicates that the high voltage cable is open or there is no high voltage cable connected.

GREEN when the cable is properly connected from the Base Station to the camera.

RED when there no cable connected to the camera or the cable is connected but open.

High voltage will not be applied to the camera until the open condition is corrected.

CABLE SHORT - indicates that the high voltage cable connected is shorted.

3) STATUS INDICATORS

BASE POWER - indicates the status of all power levels in the Base Station

GREEN when all power levels are normal.

RED when any power level is not normal.

SYSTEM LOCK - indicates that the Base Station is communicating with the Camera Unit.

GREEN when communicating with Camera Unit

RED when it is not communicating with the Camera Unit

FIBER LINK - indicates the optical power status of the Base Station and camera

GREEN when both the Base Station and camera optical power are within a normal range.

RED when both the Base Station and camera optical power are not within a normal range

AMBER when either the Base Station or camera optical power are not within a normal range

ALARM - Indicator will light RED if there is a temperature, power, hardware or firmware fault in the base unit system. The indicator will go AMBER if there is a fault at the Camera Unit.

RED if there is a Base Station error. Refer to the Base Station DIAG for details on the error.

AMBER if there is a camera error. Refer to CAM DIAG for details for the error.

T-POV 324 Base Unit Rear Panel Detail

The Base Unit rear panel Area diagram is repeated for reference.

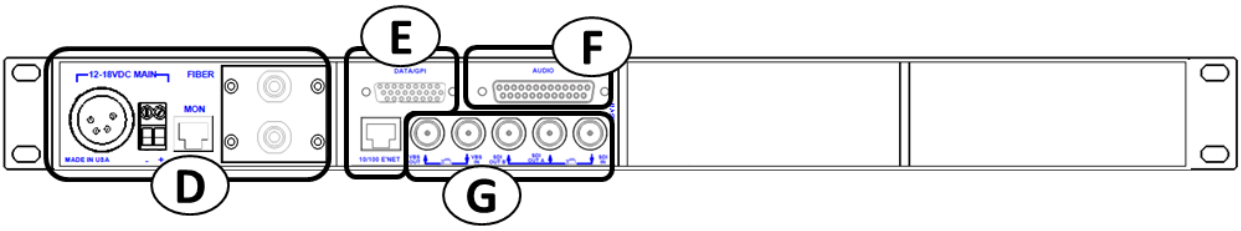


Figure 13 - T-POV 301 Base Station Rear/Connector Panel

The T-POV Base Station Connector Panel has four areas of interest:

D) Power Section and Fiber Connector(s)

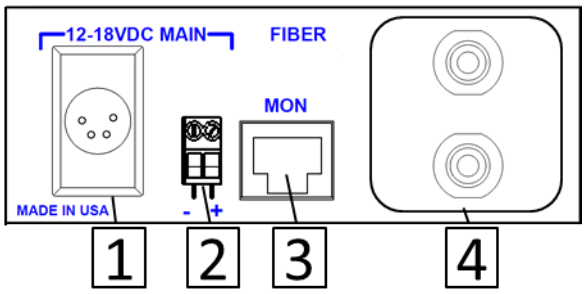
E) Data/GPI-Tally Connectors & Ethernet

F) Audio Multi-Pin Connector

G) Video Connectors

Area E – Power Section and Fiber Connector(s)

12 Volt models have a single power supply/fiber connection area regardless of the number of Optical Link units configured



12 Volt Power Models

1) **12V DC External Power Supply** input connector (XLR 4 Pin) –

   For use with an external power supply such as the Telecast Fiber ADAP-AC-04

   See Appendix 1 for connection details

2) **12V DC Input** – terminal block

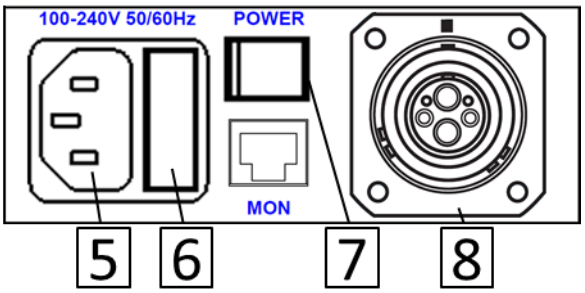
   For use in rack mounted installations as an option to an external "brick" type power supply.

   See Appendix 1 for connection details

3) For Future Use

4) ST Connectors

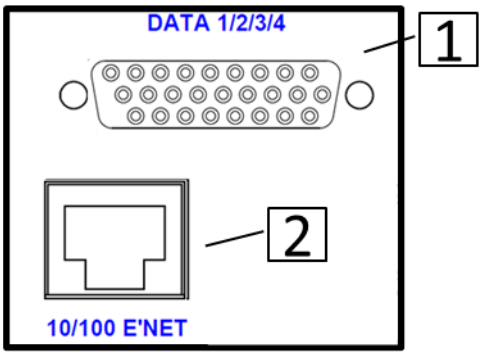
Powered models have either one or two AC power/fiber connection areas depending on the number of optical link units installed



95 Watt Powered Models

5) AC Power Receptacle
   100-240V 50/60 Hz
6) 4 AMP Dual Fuse Assembly
   The fuses supplied are standard 4 Ampere fuses – 5 x 20mm. Both fuses are in operation at all times – both the AC Line Hot and the AC Line Neutral are fused. Use Littlefuse 218 or equivalent.
7) AC Mains Power Switch – this must be turned on in order for the front panel power switch to work
8) SMPTE 304M Fiber Connector (Powered)

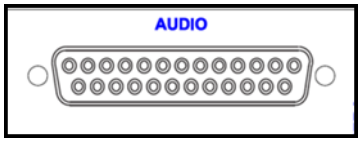
Area E – Data/GPI-Tally Connectors & Ethernet



1) **DATA 1/2/3/4** – Provides up to four bi-directional data feeds. Available are Rs232, RS422 and RS485 data formats.
2) **10/100 E'NET** – Provides an Ethernet connection to the Camera Unit for data or any network protocol controlled device such as a camera remote control.

   Ethernet port is limited to 100BaseT connections. For configuration and wiring information on all data & GPI connections please see Appendix 1

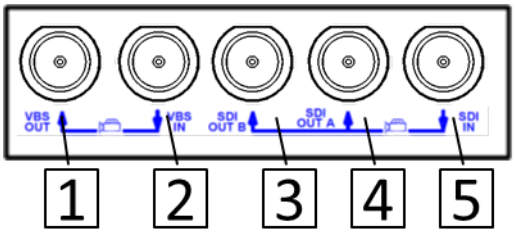
Area F – Audio Multi-Pin Connector



AUDIO – Multipin connector provides four line level audio signals in to camera unit and for four line level audio signals returning from camera unit

For audio configuration and wiring information connections please see Appendix 1

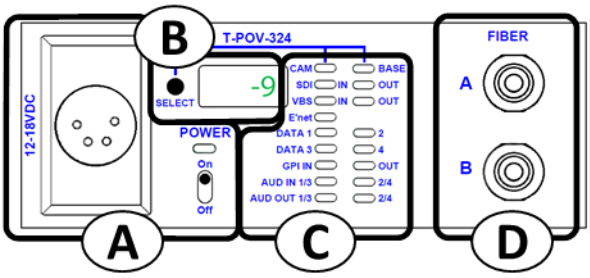
Area G – Video Connectors



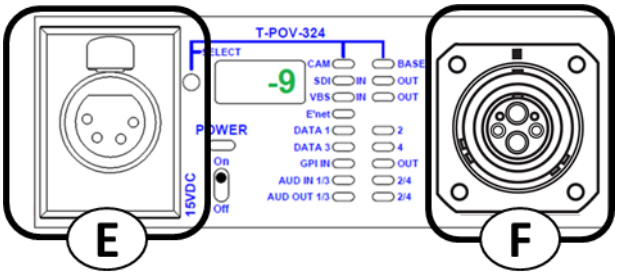
1) **VBS Out** – VBS video from Camera Unit
2) **VBS In** – VBS Video feed from Base Station to Camera Unit
3 & 4) **SDI Out A &** B – Two SDI outs of Camera video from Camera Unit
5) **SDI IN** – Return video feed to Camera Unit from Base Station

5.2 T-POV 324 Camera Unit

T-POV 324 Camera Unit Overview



T-POV 324 12 Volt Version



T-POV 324 Powered Version

The T-POV 324 Camera Unit Front Panel has six areas of interest:

A) Power Section (12 Volt Type)

B) Optical Power Strength and Diagnostic Display

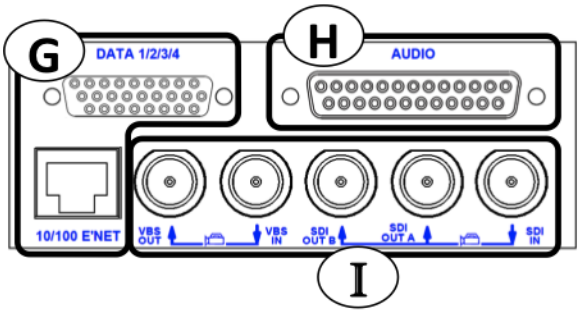
C) Signal Indicator LEDs

D) ST Fiber Connectors

E) 12-15 VDC Power Output (AC Powered models only)

F) SMPTE 304M Fiber Connector

("Wet" with 95 Watts of 12 Volt power available)



The T-POV 324 Camera Unit Rear Panel has three areas of interest:

G) Data & Ethernet Connectors

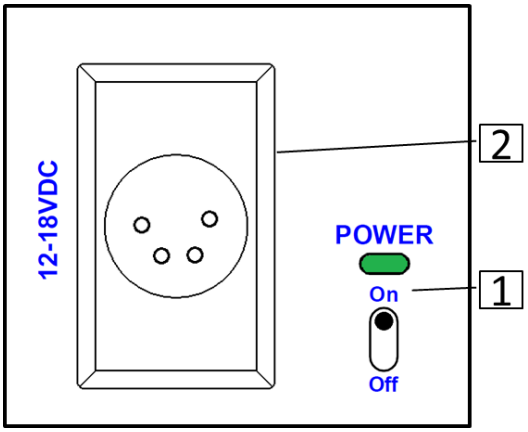
H) Audio Multi-Pin Connector

I) Video Connectors

The T-POV Camera Unit rear panel is identical in the 12 Volt and Powered versions.

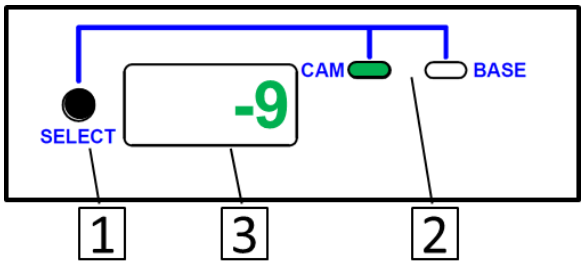
T-POV 324 Camera Unit Front Panel Detail – 12 Volt Model

Area A – Power Section (12 Volt Type)



1) **POWER** – Power indicator lights green when the power switch is toggled on.
2) **12-18 VDC Power Connection** – 4-Pin XLR Female chassis connector for use with an external power supply such as the Telecast Fiber ADAP-AC-04 or equivalent

Area B – Optical Power Strength and Diagnostic Display



1) **DISPLAY SELECT –** Push button chooses between three modes of operation

   When power is turned on, the Camera Unit optical power is first displayed. The first push of the select button will select the Base Station

   A sustained push and hold of the SELECT button will enter diagnostics, otherwise a quick push will return to the camera unit display.

2) **CAM/BASE Indicators –** LEDs indicate which unit Optical Power is displayed. Neither LED is on when the display is in diagnostics mode.

3) **DISPLAY –** Optical power is displayed in dBm units and diagnostic information is alphanumeric. Only Camera Unit diagnostics can be viewed at the Camera Unit (Base Station diagnostics are not available at the Camera Unit)

   For more information on measuring optical power and using system diagnostics please see Sections 7.5 & 7.6.

Area C – Signal Indicator LEDs

The 17 LED indicators in this area monitor the various signals being sent to or from the Camera Unit. LEDs will glow green when a signal is present.

Note: LEDs labeled "IN" indicate signals coming into the camera unit. LEDs labeled "OUT" indicate signals coming out of the Base Station. If there is neither "IN" or "OUT" associated with an LED then activity in either the Camera Unit and Base Station is indicated.

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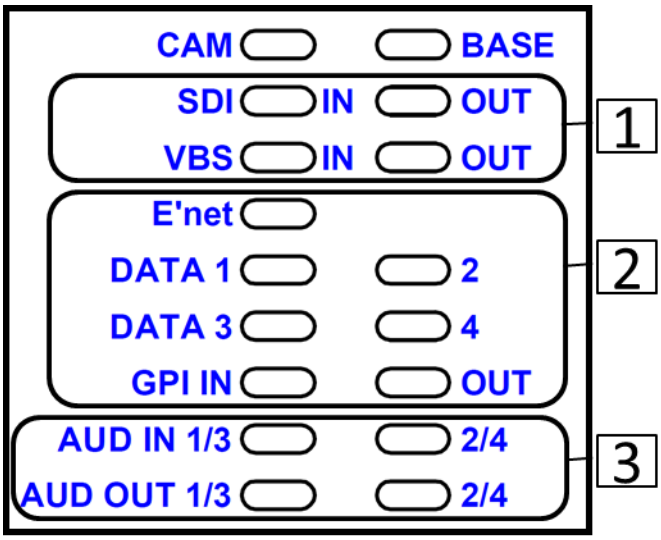


1) **SDI IN & OUT** – monitors SDI video signals to and from the Base Station

   VBS IN - monitors the black burst/sync signal or return video signal being sent to the camera

   VBS OUT – monitors the genlock signal or return video signal being sent to the base station

2) **E'NET** – Monitors data activity on the Ethernet connection

   DATA 1/2 – Monitors data activity on Data Paths 1 and 2

   DATA 3/4 – Monitors data activity on Data Path 3

   GPI – Monitors GPI/Tally signal activity

3) **AUDIO** – The AUD IN 1/3 and 2/4 LEDs monitor line level audio coming to the Camera Unit and the AUD OUT 1/3 and 2/4 LEDs monitor line level audio going to the Base Station

Area D – Fiber Connectors – "Dry" Unpowered Connectors

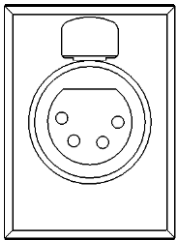
FIBER CONNECTORS – Shown are 2 ST connectors. Can be any available unpowered Fiber Connector depending on user requirements and number of camera units installed**.**

For additional information please see Section 1.5 on Fiber Connectors and Appendix 3 regarding ordering information.

T-POV 324 Camera Unit Front Panel Detail – Powered Model

The T-POV 324 Powered Camera Unit receives power from the Base Station over the Hybrid Fiber Cable connection. The 12 Volt and Powered version of the T-POV 324 operate identically with two exceptions. The powered version provides a 12-15 Volt output for camera and accessory power and the Fiber Connection must of necessity be a Hybrid Fiber Cable connection.

Area E – 12-15 VDC Power Output



12-15 VDC Power Output – Provides up to 95 Watts of 12 Volt power for the camera or accessories.

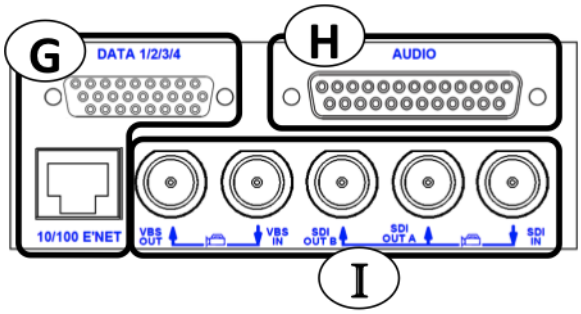
Please insure that the total power drain on this source is no more than 95 Watts. For connector wiring information see Appendix 1.

Area F – Fiber Connector

Fiber Connector – SMPTE 304M Hybrid power fiber connection carries signals to and from the Base Station and 95 Watts of12 Volt power from the base station.

T-POV 324 Camera Unit Rear Panel Detail

The Camera Unit rear panel Area diagram is repeated for reference.



The T-POV 324 Camera Unit Rear Panel has three areas of interest:

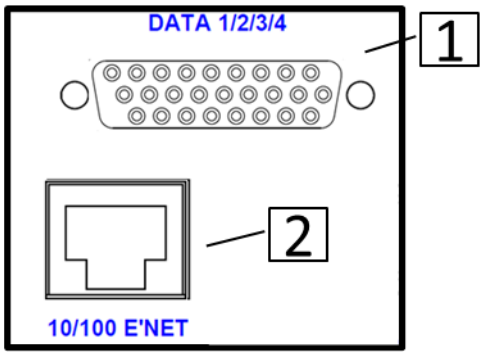
G) Data & Ethernet Connectors

H) Audio Multi-Pin Connector

I) Video Connectors

The rear connector panels of all versions of the T-POV 324 Camera Unit are identical in physical configuration and in function.

Area G – Data/GPI-Tally Connectors

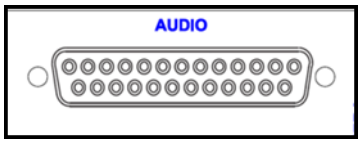


1) **DATA 1/2/3/4** – Provides up to four bi-directional data feeds. Available are Rs232, RS422 and RS485 data formats.

2) **10/100 E'NET** – Provides an Ethernet connection to the Base Unit for data or any network protocol controlled device such as a camera remote control.

Ethernet port is limited to 100BaseT connections. For configuration and wiring information on all data & GPI connections please see Appendix 1

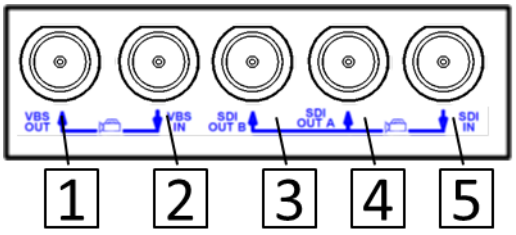
Area B – Audio Multi-Pin Connector



AUDIO – Multipin connector provides for four line level audio signals in to camera unit and for four line level audio signals returning from camera unit

For configuration and wiring information on audio connections please see Appendix 1

Area C – Video Connectors



1) **VBS Out** – VBS video from Camera Unit
2) **VBS In** – VBS Video feed from Base Station to Camera Unit
3 & 4) **SDI Out A &** B – Two SDI outs of Camera video from Camera Unit
5) **SDI IN** – Return video feed to Camera Unit from Base Station

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Chapter 6. Connection of the T-POV Robotic Camera Link System

Prior to connecting your T-POV Robotic Camera Link System please insure that each of the required cables is available for use. This includes standard video, audio and data cables as well as custom multi-pin cable sets required for your particular installation. Please see the Appendix for information regarding cables and connectors. Covered in this chapter are:

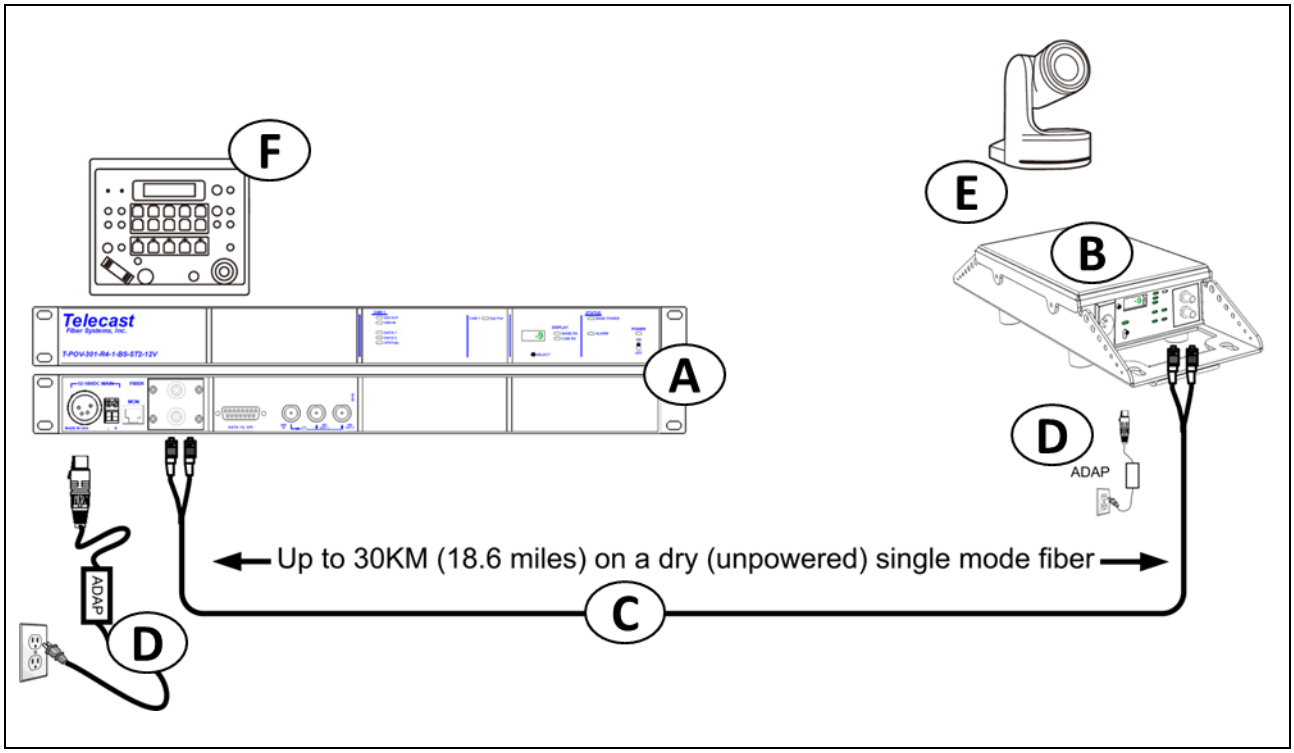
1) T-POV Usage Scenarios
2) Base Station Connections
3) Camera Unit Connections

6.1 T-POV Usage Scenarios

The three scenarios shown represent a small cross-section of the various available configurations. Please consider these scenarios as samples of how a system might be used in a real-world application.

The following fiber connection scenarios do not take into account any customized cable and connector installations you may have at your facility. For assistance regarding more complex connection situations please contact Telecast Fiber Systems or your local authorized dealer.

Tactical Fiber between the Base Station and Camera Unit



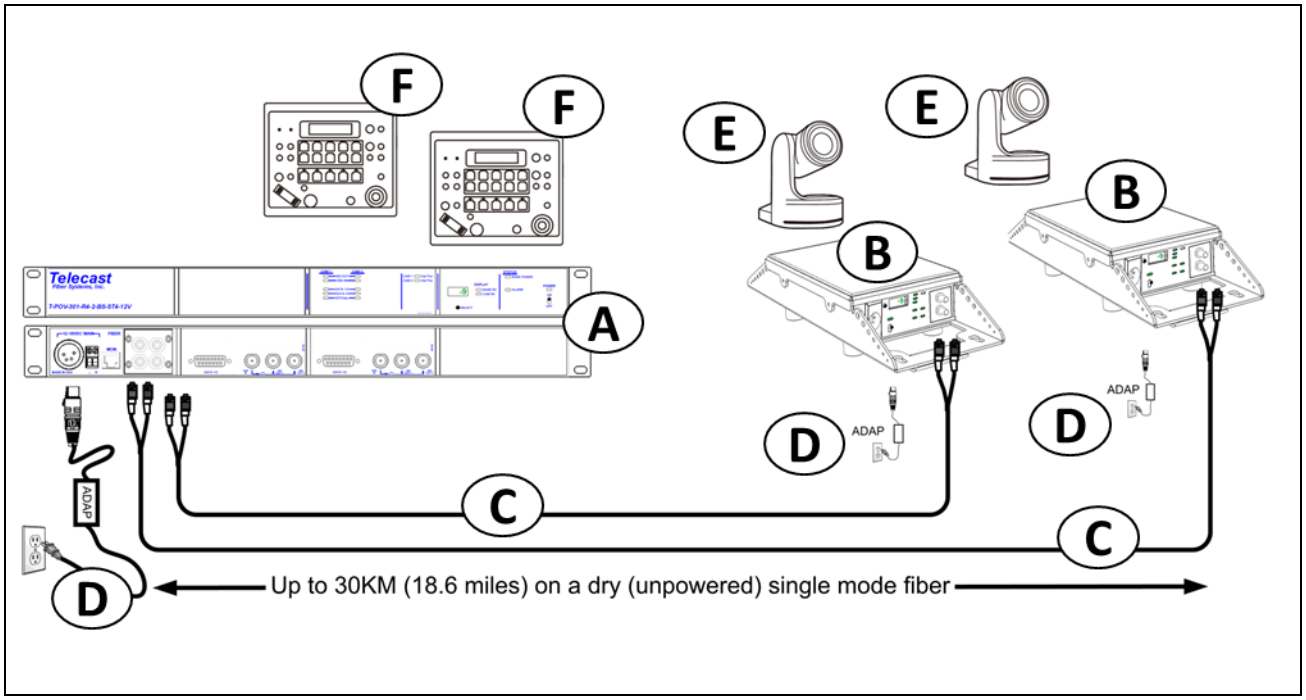
Between the Base Station **(A)** the Camera Unit **(B)** is a length of Tactical Fiber Cable **(C).** At each end of the fiber cable are a set of two ST Connectors.

The Camera Unit and the Base Station are powered by an external 12 Volt power supply **(D)**. The recommended Telecast Fiber ADAP-AC-04 is illustrated. The Camera connected to the Camera Unit must have its own separate power source.

Connected to the Base Station is a Camera Control Unit (CCU) with camera controls and remote pan and tilt controls **(F)**. Depending on the control unit requirements the connection to the base station will be either a serial data connection or an Ethernet connection.

Connected to the Camera Unit is a remote HD Camera **(E)** mounted on a remotely controlled pan and tilt unit. Typically the camera will be connected to the T-POV Camera Unit by an HD-SDI BNC cable and the pan and tilt unit will be connected through either a serial data connection or an Ethernet Connection.

Two Link Unit Installation with Tactical Fiber between the Base Stations and The Camera Units

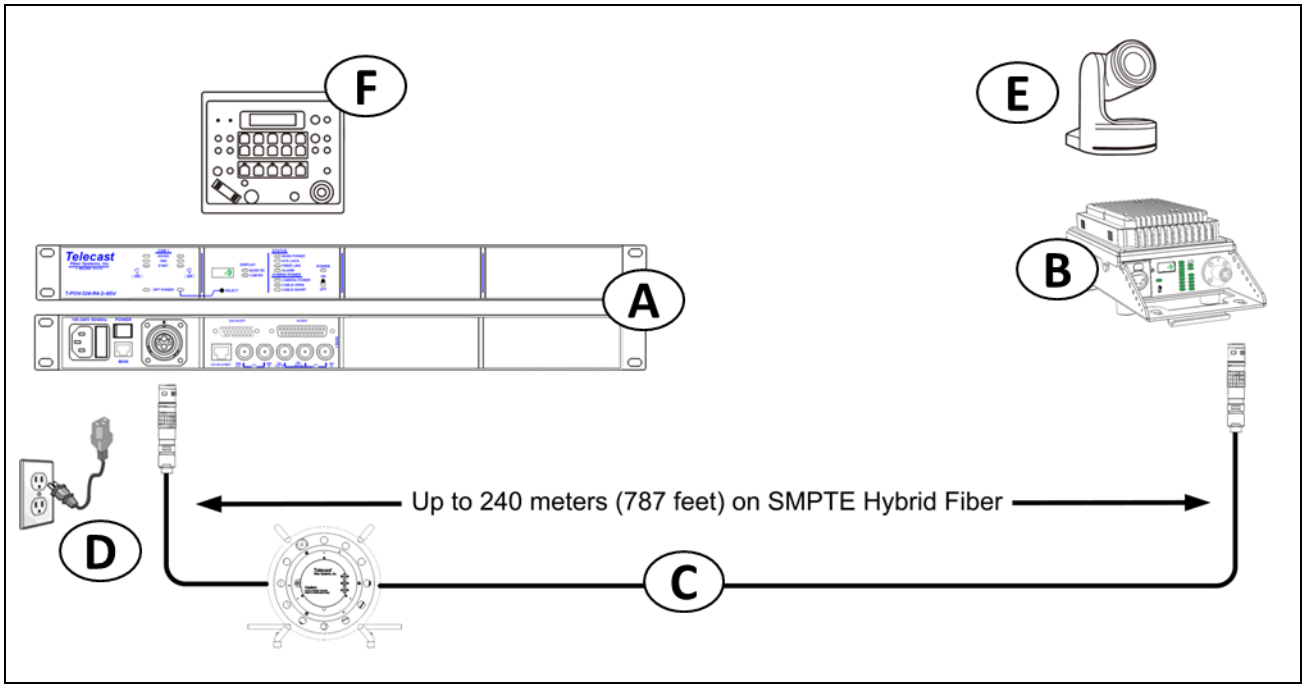


This scenario is functionally idential to the first usage scenario with the addition of an added Camera Unit and CCU/Remote Pan & Tilt unit. One 2-Link Unit Base Station **(A)** is connected by Fiber Cable to two separate Camera Units **(B)**. The Camera Unit connections begin with Unit 1 on the left next to the Power and Fiber Connector module. Units 2 is to the right of Unit 1.

The Camera Units in this example use 2 ST connectors each. The Base Station and each Camera Unit are powered by an ADAP external 12 Volt power supply **(D)**.

This example shows two identical Cameras **(E)** connected to the Camera Units. This is illustrative only and a real-world installation could have two different camera types if required. This example shows two individual Camera Control – Remote Pan & Tilt units **(F)**. A common CCU could be used if it provides a separate data connection for each of the remote cameras.

Hybrid Fiber between the Base Station and Camera Unit



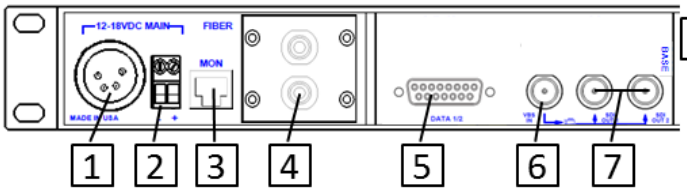
Between the Base Station **(A)** the Camera Unit **(B)** is a length of Hybrid Fiber Cable **(C).** The maximum length of this hybrid cable is 240 meters. The cable is deployed from a Telecast Fiber fiber reel. At each end of the fiber cable is either a "wet" SMPTE 304M Fiber Connector carrying 12 Volts of power.

The Base Station is powered by an internal AC power supply **(D)**. The Camera Unit is powered through the Hybrid Fiber Cable. The Camera **(E)** connected to the Camera Unit can either be powered from the external power connection on the T-POV Camera Unit or from its own local power supply. If the camera is powered from the T-POV the total power budget must not exceed a total of 95 Watts.

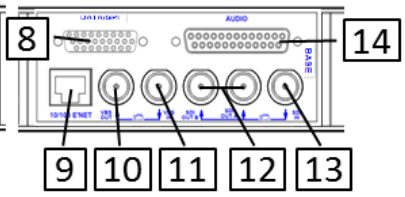
Connected to the Base Station is a Camera Control Unit (CCU) with camera controls and remote pan and tilt controls **(F)**. Depending on the control unit requirements the connection to the base station will be either a serial data connection or an Ethernet connection (T-POV 324 only).

6.2 Connections to the T-POV Base Station

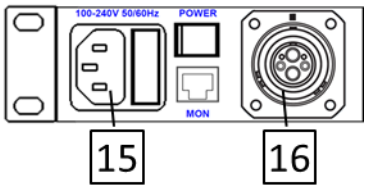
This section provides details on both the connectors and signal types that can be applied to the T-POV Base Stations. The T-POV 301 and 324 are presented as illustrations. In the list of connections it is noted which connections are applicable to the various T-POV models.



T-POV 301 Base Station Connectors



T-POV 324 Base Station Connectors



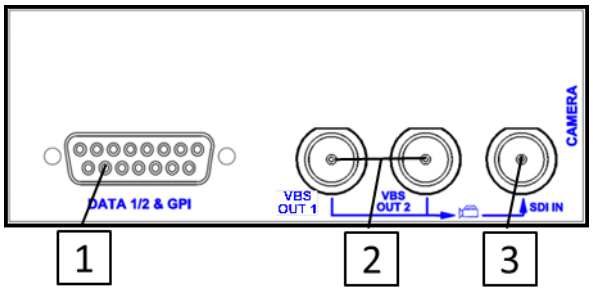
T-POV Powered Base Station Connectors

1 & 15	**Power In** Connect a standard 12V DC ADAP power source (4 Pin) or a standard 3 conductor AC Cable (IEC Plug) 100-240V 50/60 Hz *Applies to all models depending on power type.*
2	**12V Terminal Block** Terminal Block – bare wire connector. This can be used in place of the ADAP power connection in installations that have 12V power distributed as part of their infrastructure. Do not use this at the same time as the ADAP power connection. *Applies only to 12 Volt models – does not apply to AC powered types*
3	**MON - RJ45 Network Type Connection** For Future Use *Applies to all models*
4 & 16	**Fiber Connector** Connect the fiber connector from the Fiber Cable connected to the Camera Unit. The type of fiber connector depends on whether the system is 12 Volt or internally powered. *Applies to all models.*

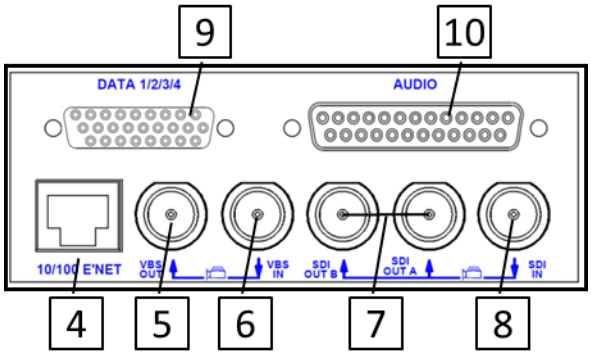
	Power to the Base Unit (and the Camera Unit) must be turned off when connecting the Camera Remote Control Panel – connecting with the power on can seriously damage your equipment.
5	**Data 1/2 & GPI** DB15 - 15 Pin data connector. Used for a variety of serial connections or GPI/Tally connections. The Camera Control Unit and Pan & Tilt Control is one such data connection. *Applies to T-POV 301*
6 & 11	**VBS IN** BNC Connector – Typically used to send a Genlock/Black Burst signal or SD return video to the camera – an example is monitor out from the Production Switcher. *Applies to all models*
7 & 12	**SDI Out 1 & 2 or A & B (this carries the HD feed from the camera)** BNC Connectors – Two identical video feeds from the camera unit – typically one may be used for local HD monitoring and one is fed to the Production Switcher environment. *Applies to all models*
8	**DATA/GPI** DB26 - 26 Pin data connector. Used for a variety of serial connections or GPI/Tally connections. The Camera Control Unit and Pan & Tilt Control is one such data connection. *Applies to T-POV 324*
9	**Ethernet Connector – 10Bt/100Bt capable** Designed to carry IP traffic data between the Base Station and the Camera Unit. Can be used to control Ethernet based Camera and Pan & Tilt equipment. Also a laptop PC or other device such as a Wireless Access Point can be connected to the Production Environment IP network. *Applies to T-POV 324*
10	**VBS Out** BNC Connector – Carries SD Analog video from the Camera Unit to the Base Station. Typically this will feed a Camera SD menu monitor feed. Note: An HD signal can be sent through the VBS path but the system will only pass SD quality. *Applies to T-POV 324*
13	**SDI In** BNC Connector – Typically used to send HD return video to the camera – an example is program out from the Production Switcher. *Applies to T-POV 324*
14	**Audio** DB25 – 25 Pin connector. Connector follows the Tascam TDIF standard. Up to 4 channels of line level audio in and out can be connected. *Applies to T-POV 324*

6.3 Connections to the T-POV Camera Unit

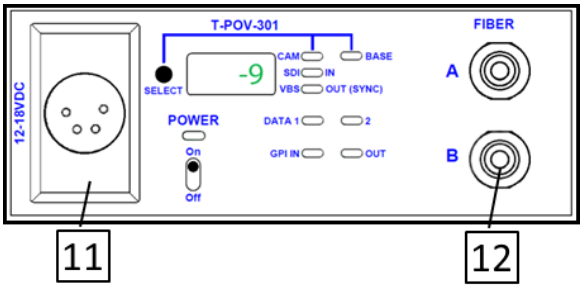
This section provides details on both the connectors and signal types that can be applied to the T-POV Camera Units. The T-POV 301 and 324 are presented as illustrations. In the list of connections it is noted which connections are applicable to the various T-POV models.



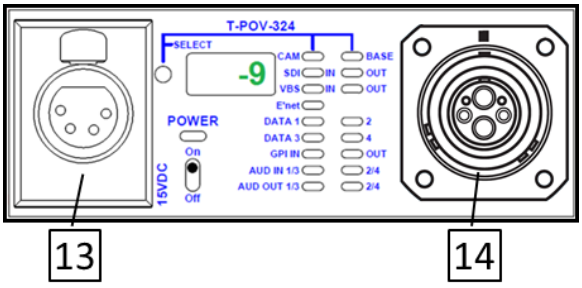
T-POV 301 Camera Unit



T-POV 324 Camera Unit



T-POV 301 Camera Unit



T-POV 324 Camera Unit

1	**Data 1/2 & GPI** DB15 - 15 Pin data connector. Used for a variety of serial connections or GPI/Tally connections. *Applies to T-POV 301*
2 & 5	**VBS Out** BNC Connector – Typically used to send a Genlock/Black Burst signal or SD return video to the camera – an example is monitor out from the Production Switcher. *Applies to all models*
3 & 8	**SDI In** BNC Connectors – HD Video feed from the camera unit to the base station – typically this is fed to the Production Switcher or primary monitoring environment. *Applies to all models*

4	**Ethernet Connector – 10Bt/100Bt capable** Designed to carry IP traffic data between the Base Station and the Camera Unit. Can be used to control Ethernet based Camera and Pan & Tilt equipment. Also a laptop PC or other device such as a Wireless Access Point can be connected to the Production Environment IP network. *Applies to T-POV 324*
6	**VBS In** BNC Connector – Carries SD Analog video from the Camera Unit to the Base Station. Typically this will feed a Camera SD menu monitor feed. *Applies to T-POV 324*
7	**SDI Out A & B** **BNC Con**nector – Typically used to send HD return video to the camera – an example is program or aux bus out from the Production Switcher *Applies to T-POV 324*
9	**DATA 1/2/3/4** DB26 - 26 Pin data connector. Used for a variety of serial connections or GPI/Tally connections. The Camera Control Unit and Pan & Tilt Control is one such data connection. *Applies to T-POV 324*
10	**Audio** DB25 – 25 Pin connector. Connector follows the Tascam TDIF standard. Up to 4 channels of line level audio in and out can be connected. *Applies to T-POV 324*
11	**Power In** Connect a standard 12V DC ADAP power source (4 Pin) *Applies to all models that have external power.*
12 & 14	**Fiber Connector** Connect the fiber connector from the Fiber Cable connected to the Camera Unit. The type of fiber connector depends on whether the system is 12 Volt or internally powered. *Applies to all models.*
13	**Power Out** Provides a standard 12V DC power source (4 Pin). Total power available including that used by Camera Unit is 95 Watts. *Applies to all models that have external power.*

Chapter 7. Operation of the T-POV Robotic Camera Link System

This chapter describes in detail the operation of T-POV Robotic Camera Link System. Please keep in mind that a wide variety of options and variations are available in using this product and so not every possible operational environment can be described. Variations in camera type, battery and powering, fiber cable connections allow for an enormous number of slightly different operational modes.

The following topics are covered:

1) Set Up of the T-POV Robotic Camera Link System
2) Planning and Managing the Fiber Cable Route
3) Connecting the Fiber Cable
4) Powering the System
5) Brief Guide to the Measurement of Fiber Optic Signal Strength
6) Using the Digital Displays
7) Standard Operation
8) Shutting Down the System
9) Troubleshooting

7.1 Set Up Of The T-POV Robotic Camera Link System For Operation

This section provides a high-level overview of setup of the T-POV Robotic Camera Link System for operation. The following sections provide additional detail on each aspect of setup and operation.

It is important that you do an initial setup and test of your T-POV Robotic Camera Link System for operation as soon as your receive in order to confirm proper operation and to provide training to you and your team prior to an actual production.

It is highly recommended that you do not attempt to power up the system until all connections are made and in particular the Fiber Optic Cable has been connected at both ends. If you need to power up either the T-POV Robotic Camera Link Base Station or Camera Unit make sure that the Fiber Connectors are securely capped. This will protect them from damage or dirt and protect you from eye damage.

The order in which you connect the cables makes no difference. Make sure to connect the Camera Remote Control cable to the Base Station and Remote Control Panel when the Base Station power is turned off.

Make sure to connect the Camera Remote Control cable to the Camera Unit and Camera when the Camera power is turned off.

Deploy the Fiber Cable (see the next section) – you are now ready to Power Up the system.

7.2 Planning and Managing the Fiber Cable

Planning and managing the Fiber Cable between the T-POV Camera Unit and Base Station requires you to perform four tasks:

1) Plan the route the Fiber Cable will take between the Camera Unit and the Base Station.
2) Run the Fiber Cable along the planned route
3) Connect the Fiber Cable Connectors at each end
4) Power up the Camera Unit and the Base Station and check the Fiber Optic Cable Link and signal strength

Obviously the longer the planned cable run, the more planning required. It also makes a difference whether you are running Single Strand Fiber Cable or Multi-Strand Fiber Cable as these affect both the length and the type of exposure the cable can endure.

When planning your cable route take into the consideration the following:

- Possible obstacles that might cause you to run short of cable – you may need to take a more indirect, but achievable route
- Possible hazards to the cable – while tactical fiber is extremely durable it is not immune to damage. An obvious hazard is running the cable across a lawn scheduled to be cut during your live production. Make sure the empty roadway at 6AM will not be filled with heavy equipment when it comes time to retrieve your cable
- Possible interference (physical) with the cable that might cause it to bend or kink to an extent that unacceptable signal loss occurs.
- Safety hazards – make sure that the cable will not cause a tripping or tangling hazard with people, animals or vehicles.

Decide whether the Fiber Cable is to be unspooled from the Base Station location or the Camera Unit location. Typically the reel is kept close to the base station. However if there is a chance the Camera Unit location may need to move further away from the Base Station after initial placement it makes sense to place the reel at the Camera Unit end of the fiber cable. Make sure there is enough free cable coming out of the stationary end of the cable reel to accommodate a well-managed connection to the Camera Unit

Planning the cable route requires common sense and the ability to foresee the unforeseen.

7.3 Running the Fiber Cable

Do the following when running your Fiber Cable:

- Make sure that both ends of the Fiber Cable are securely capped. In this case the concern is dirt and damage. ANY dirt in the connector can adversely affect Fiber Optical performance and potentially cause you to lose the use of your camera while the problem is diagnosed and remedied.
- If the cable run is long or if you will lose sight of the spooling out cable reel make sure you have appropriate assistance in running out the cable. When retrieving the cable, assistance to prevent the cable end from being caught or tangled up could be critical. Don't start reeling in the cable on your own and assume the Connector end will make it back to home base safely.
- When unspooling the cable ALWAYS make sure the stationary end (the end that goes to the T-POV Base Station) is securely contained within the reel. A loose Connector can bang around and be damaged and NEVER connect the stationary end of the Fiber Cable to the T-POV Base Station and start unspooling the Fiber Cable. Severe damage to the cable could occur due to extreme spiraling of the connected portion of the cable.

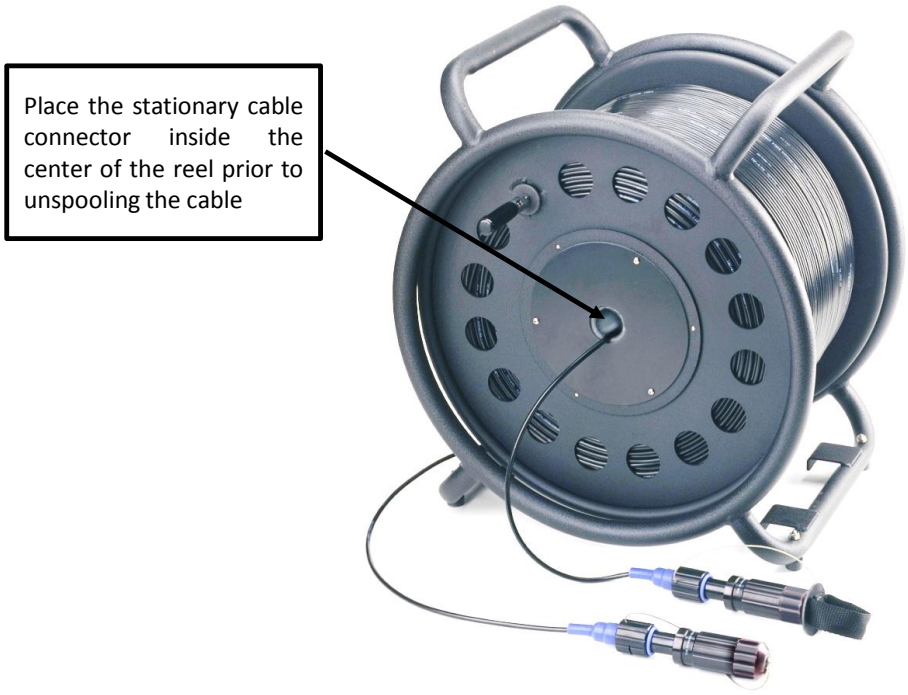


Figure 14 - Fiber Cable Reel

Prior to connecting the Fiber Connectors to the T-POV Units, inspect both Connectors. If required, clean with dry compressed air or with technical wipes that have been moistened with isopropyl alcohol. Fingerprints or other dirt on the optical connector end surfaces will reduce the optical signal level on the fiber. If the connectors have been properly capped during storage and movement you will not likely have a problem. However if a connector has been dropped or dragged through dirt or exposed to dust cleaning is recommended.

Once the Fiber Cable has been connected it is time to secure the Fiber Cable run. Make sure there are no cable hazards in the run. Secure the cable with Cable Guards and/or Gaffers tape to insure safety.

Now the system can be powered on. Plugging in Fiber Cable connectors with the power on will not damage the system but is not recommended because of the chance of possible eye damage.

When re-spooling the Fiber Cable on to the spool guide it across the entire width of the spool so that it winds evenly and the possibility of cinching or kinks is greatly reduced.

7.4 Powering the System

The T-POV Base Station and the T-POV Camera Unit each have a power up routine which tests the equipment and performs a system diagnostic.

Powering the T-POV Base Station

Base Station Main Power	1. For **externally** powered Base Stations plug in the power supply. For **internally** powered Base Station connect the unit to the AC Mains and turn on the Base Station Power Mains Switch located at the rear left (when facing the back of the Base Station) of the unit. The front panel power light will come on and be red until the next step.
Base Station Power	2. Turn on the Front Panel Power Switch located at the front right. For internally (AC) powered units the power monitor indicator turns from red to green.
Four Character Display LED Indicator progression	3. The 4-character display indicates TEST and all front panel LEDs turn, red, then green, then orange, then off.
REV display	4. The LED color test is followed by REV and the revision of the display microcontroller firmware.
Scrolling	5. The REV indication is followed by "telecast-fiber.com" scrolling across the 4-character display. If there's no scrolling please contact Telecast Fiber Systems support for assistance.
PAUSE	6. The scroll is followed by about a 3 second interval used to synchronize all the microcontrollers in the Base Station
Current Status Displayed	7. After the 3 second pause, each of the entire front panel LEDs update with current status. If the Camera Unit is not powered on the camera related status lights will show red.

Powering the T-POV Camera Unit

Camera Unit power	1. Turn on the Camera Unit Power Switch
Camera Power	2. Turn on the Camera Power and also any peripheral equipment connected to the camera or the T-POV Camera Unit such as monitors and microphones.
Four Character Display LED Indicator progression	3. On power on the 4-character display indicates the current Revision Version (REVA). Your unit will reflect the current Revision Version. After the revision display the current Fiber Link strength is displayed. A typical display is -8 to -13. This indicates Fiber link strength of from -8 to -13 dBm.

7.5 A Brief Guide to Measurement of Fiber Optic Signal Strength

The T-POV Optical Link System operates within a defined fiber optic link margin, based on two factors:

1. Output (or "launch") power of the optical transmitter at each end of the link: typically -7dBm*
2. Sensitivity of the optical detector at each end of the link: typically -22 dBm.

The following diagram illustrates the Fiber Link transmission range related to Optical Power

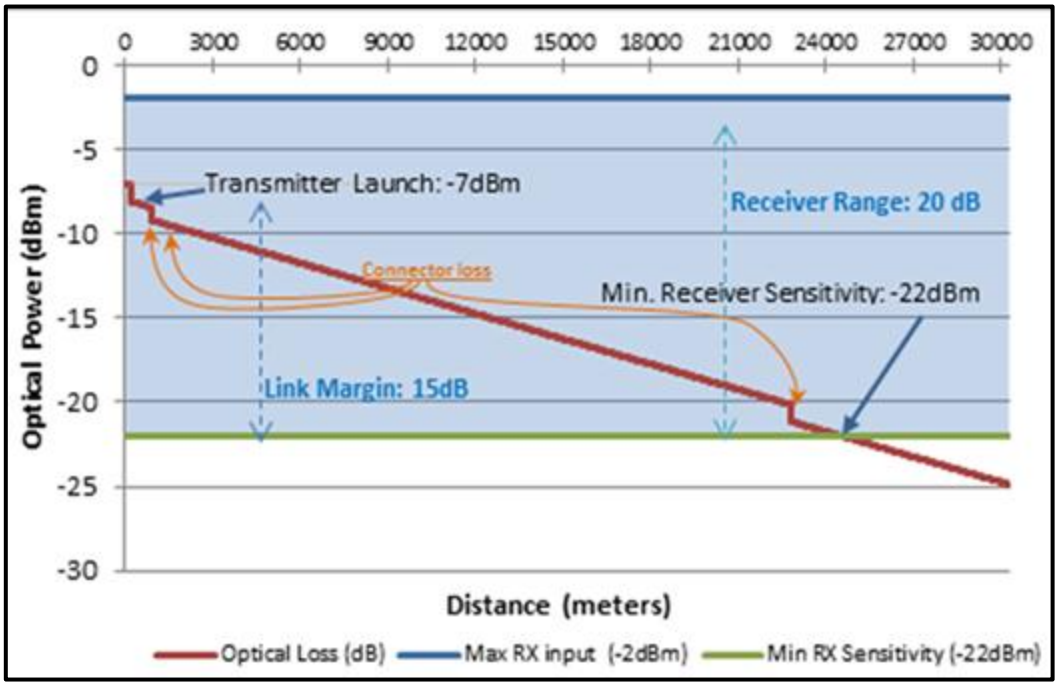


Figure 15 – T-POV Fiber Optic Link Margin

The overall link margin (or dynamic range) of the T-POV system (the difference between the transmitter's output power and the receiver's sensitivity) is typically 15dB.

That margin is consumed by two main factors:

1. Optical loss over the length of the fiber cable: typically 0.5dB per kilometer
2. Optical loss at connection points: typically 1 dB per connector

Therefore, a Tactical Fiber T-POV system can optimally work over 24 kilometers of cable (spending 12 dB of the link budget), and three connectors (spending 3 dB of the budget).

The T-POV Transceiver System provides direct digital readout of the Fiber Optic Link signal strength for both the Base-to-Camera link and the Camera-to-Base link.

*The unit "dBm" is an abbreviation for the optical power measured in decibels referenced to one milliwatt (mW).

7.6 The T-POV Base Station Digital Display

The digital readouts on both the T-POV Base Station and Camera Unit provide direct signal strength measurements in dBm. These readouts also provide a wide range of diagnostic information. The use of the digital readouts is described in this section.

The Base Station digital display has three functions selected by the Display Mode SELECT button. These functions are indicated by the Display Mode LEDs.

BASE RX – Base Station Optical Power or Signal Strength that is being received at the Base Station. Displayed in units of –dBm. The acceptable range for operation is -7dBm down to -22dBm. *

CAM RX – Optical Power or Signal Strength being received at the Camera Unit. Displayed in units of –dBm. The acceptable range for operation is -7dBm down to -22dBm. *

DIAG – One of four diagnostics modes:

TEMP – displays operating temperature in degrees Centigrade of each circuit board that reports temperature

POWR – displays power level from monitored circuit boards

REV – displays microcontroller firmware version from each circuit board with a microcontroller

CAM – displays the error status reported by the Portable Unit

To select the different display modes, push the SELECT button. The transition from one mode to another may take a moment, with the transition into the DIAG mode taking slightly longer. The Selector is cyclical rotating through each of the modes. Once in the DIAG mode, a quick push of the SELECT button cycles through the various diagnostic sub-modes described above.

Diagnostic Display Modes

The following table describes the sequence, abbreviations, and expected readouts in each of the display modes.

Display Mode	Typical Readout	Base Station Digital Display Activity Explanation
(assumes after initial power up – see Page 68 for a description of the Power Up sequence)		
		BASE RX (Base Station Receive Signal Strength)
BASE RX	-9	Indicates that the Base Station signal strength is -9 dBm
		CAM RX (Portable Unit Receive Signal Strength)
CAM RX	-9	Indicates that the signal strength from the Portable Unit is -9 dBm
		The display will cycle between "COPT" (Camera Optical) and "BOPT" (Base Optical) before/after the numerical optical Power Reading.

Display Mode	Typical Readout	Base Station Digital Display Activity Explanation
		DIAGNOSTIC MODE Temperature (TEMP)
DIAG		When first entering the Diagnostic mode the DISPLAY indicator LED will blink – the first sub-mode displayed on the digital readout is TEMP (Temperature).
DIAG/TEMP	TEMP	Indicates the display is in the TEMP sub-mode
DIAG/TEMP	PS	The Power Supply (PS) temperature will be displayed
DIAG/TEMP	TEMP	Repeats that the display is in the TEMP sub-mode
DIAG/TEMP	37C	Temperature display in Centigrade for Power Supply circuit board
DIAG/TEMP	BASE	The Base Station main circuit board temperature will be displayed
DIAG/TEMP	TEMP	Repeats that the display is in the TEMP sub-mode
DIAG/TEMP	47C	Temperature display in Centigrade for Base Station circuit board
DIAG/TEMP	PS	The Power Supply (PS) temperature will be again displayed
DIAG/TEMP	TEMP	Repeats that the display is in the TEMP sub-mode
DIAG/TEMP	36C	Temperature display in Centigrade for Power Supply circuit board NOTE: that the PS temperature has dropped one degree
		This display cycle repeats until the Display Mode Selector is pushed
		DIAGNOSTIC MODE Power Supply Voltage Status (POWER)
DIAG/POWER		A quick push of the Display Mode Selector advances to the Power (POWR) diagnostic sub-mode.
DIAG/POWER	POWR	Indicates the display is in the POWER sub-mode
DIAG/POWER	BASE	Indicates that the Base Station main controller board is being measured
DIAG/POWER	POWER	Indicates the display is in the POWER sub-mode
DIAG/POWER	OK	Indicates that the item is in an OK State
DIAG/POWER	DISP	Indicates that the LED Display controller board is being measured
DIAG/POWER	POWER	Indicates the display is in the POWER sub-mode
DIAG/POWER	OK	Indicates that the item is in an OK State
DIAG/POWER	CHAR	Indicates that the Four Character controller board is being measured
DIAG/POWER	POWR	Indicates the display is in the POWER sub-mode
DIAG/POWER	OK	Indicates that the item is in an OK State
DIAG/POWER	AUD	Indicates that the Audio controller board is being measured
DIAG/POWER	POWR	Indicates the display is in the POWER sub-mode
DIAG/POWER	OK	Indicates that the item is in an OK State
DIAG/POWER	VBS	Indicates that the VBS (analog Video) controller board is being measured
DIAG/POWER	POWR	Indicates the display is in the POWER sub-mode
DIAG/POWER	OK	Indicates that the item is in an OK State
		DIAG/POWER Exception
DIAG/POWER	ERR	Instead of OK, the display will show ERR if a power level is outside of normal – ERR is followed by a Hexadecimal code. Please note the error code and contact support at Telecast-Fiber.

Display Mode	Readout	Base Station Digital Display Activity Explanation
		DIAGNOSTIC MODE Microcontroller Board Revision Version (REV)
DIAG/REV		A quick push of the Display Mode Selector advances to the Power (POWR) diagnostic sub-mode. This sub-mode displays the microcontroller firmware revision of every board in the Base Station that has a microcontroller.
DIAG/REV	REV	Initial display of REV after Display Mode Selector being advances
DIAG/REV	DISP	Indicates the Display microcontroller board is revision is being queried
DIAG/REV	REV	Indicates that sub-mode is REV
DIAG/REV	REVC	Indicates that the REV for the DISP board is REVC
DIAG/REV	VBS	Indicates the VBS microcontroller board is revision is being queried
DIAG/REV	REV	Indicates that sub-mode is REV
DIAG/REV	REVA	Indicates that the REV for the VBS board is REVA
DIAG/REV	BASE	Indicates the Base Station main microcontroller board is revision is being queried
DIAG/REV	REV	Indicates that sub-mode is REV
DIAG/REV	REVA	Indicates that the REV for the BASE board is REVA
DIAG/REV	AUD	Indicates the audio microcontroller board is revision is being queried
DIAG/REV	REV	Indicates that sub-mode is REV
DIAG/REV	REVA	Indicates that the REV for the AUD board is REVA measured – applicable 324 model (Your Revision may differ)
DIAG/REV	PS	Indicates the power supply microcontroller board is revision is being queried
DIAG/REV	REV	Indicates that sub-mode is REV
DIAG/REV	REVD	Indicates that the REV for the DISP board is REVD (Your Revision may differ)
		This display cycle repeats until the Display Mode Selector is pushed
		DIAGNOSTIC MODE Camera Unit Error Status (CAM)
		A quick push of the Display Mode Selector advances to the Portable Unit (CAM) diagnostic sub-mode. This mode displays the error status of the Portable Unit. The Digital Display Characters are green if Portable Unit shows no error and red if the Portable Unit does have an error. This is a high-level view of the Portable Unit error status. For further information go to the Portable Unit diagnostic display.
DIAG/CAM	CAM	Indicates that the sub-mode is CAM
DIAG/CAM	OK	Indicates that the Portable Unit is reporting *No* fault
DIAG/CAM	ERR	Indicates that the Portable Unit is reporting *Some* fault
		This display cycle repeats until the Display Mode Selector is pushed

The T-POV Portable Unit Digital Display

The Portable Unit Digital Display has six functions selected by the Display Selector.

1. **COPT** – Camera Unit Optical Power or Signal Strength (Camera OPTical) that is being generated at the Portable Unit and sent to the Base Station. Displayed in units of –dBm.
2. **BOPT** – Optical Power (Base OPTical) or Signal Strength generated by the Base Station as measured at the Portable Unit. Displayed in units of –dBm.
3. **TEMP** – displays operating temperature in degrees Centigrade of each circuit board that reports temperature
4. **POWR** – displays power level from monitored circuit boards
5. **REV** – displays microcontroller firmware version from each circuit board with a microcontroller

To select the different display modes push the Display Selector. The transition from one mode to another may take a moment. The Selector is cyclical rotating through each of the modes.

The following table describes the sequence, abbreviations, and expected readouts in each of Portable Unit's alpha-numeric display modes.

Readout	Portable Unit Digital Display Activity Explanation
	(assumes after initial power up – see Page 68 for a description of the Power Up sequence)
	COPT - Portable Unit Optical Signal Strength
COPT	Indicates that the Display is showing the optical signal strength at the Portable Unit
-9	Indicates that the Portable Unit signal strength is -9 dBm
	BOPT (Base Station Signal Strength)
BOPT	Sequence starts with BOPT to indicate the optical signal strength at the Base Station
-9	Indicates that the signal strength being received at the Base Station is -9 dBm
	This display cycle repeats until interrupted by the BASE Rx/DIM button. . A quick push of the BASE Rx/DIM button returns to the COPT mode A longer push (approximately 5 seconds) advances to DIAG mode.

Readout	Portable Unit Digital Display Activity Explanation
	DIAGNOSTIC MODE Power (POWR)
Holding the SELECT button for approximately five seconds advances to the First diagnostic mode, which is POWR status. This mode cycles through the following sequence and may start at any point in the cycle.	
LBUS	Indicates that the LBUS controller board is being measured
POWR	Indicates the display is in the POWER sub-mode
OK	Indicates that the item is in an OK State
UBUS	Indicates that the UBUS controller board is being measured
POWR	Indicates the display is in the POWER sub-mode
OK	Indicates that the item is in an OK State
OBOX	Indicates that the Audio Interface Box controller board is being measured – applicable to 324 model
POWR	Indicates the display is in the POWER sub-mode
OK	Indicates that the item is in an OK State
MAIN	Indicates that main Portable Unit controller board is being measured
POWR	Indicates the display is in the POWER sub-mode
OK	Indicates that the item is in an OK State
	DIAGNOSTIC MODE Microcontroller Board Revision Version (REV)
	A quick push of the SELECT button from PWR mode advances to the REV mode. This mode displays the microcontroller firmware revision of every board in the Portable Unit. This mode cycles through the following sequence and may start at any point in the cycle.
REV	Indicates that mode is REV
OBOX	Indicates the OBOX microcontroller board is revision is being queried – applicable to and 324 model
REVD	Indicates that the REV for the Audio Interface Box board is Revision “D” – Your revision may differ
REV	Indicates that mode is REV
MAIN	Indicates the BASE microcontroller board is revision is being queried
REVD	Indicates that the REV for the BASE Portable Unit controller board is Revision “D” – Your revision may differ
REV	Indicates that mode is REV
UBUS	Indicates the UBUS microcontroller board is revision is being queried
REVD	Indicates that the REV for the UBUS board is Revision “D” – Your revision may differ

Readout	Portable Unit Digital Display Activity Explanation
	DIAGNOSTIC MODE Temperature (TEMP)
	A quick push of the SELECT button from REV mode advances to the TEMP mode. This mode displays the internal temperature (in degrees centigrade) of the Portable Unit. This mode cycles through the following sequence and may start at any point in the cycle.
TEMP	Sequence starts with TEMP to indicate Temperature Display mode
MAIN	The Portable Unit MAIN controller board temperature will be displayed
61C	Temperature display in Centigrade for Portable Unit main circuit board

7.7 Standard Operation

The section is devoted to a number of “Best Practices” for use of the T-POV Robotic Camera Link System. Specific information on how to operate the system has been presented in the sections above.

Take the possibility of Laser Eye damage seriously. It is not likely but you don’t want to be the one-in-a-million case.

Protect the Fiber Optic Cable and the Fiber Optic Connectors. **Always** keep these capped unless there are being connected.

Read the section on planning the Fiber Run – it may come in handy – Page 65.

Once the system is set up and running, do not ignore the Optical Power Signal Strength Readouts at either the Camera Unit or the Base Station. While the Alarm functions of the system are very good, so is the tolerance for optical Signal Strength reduction. By monitoring –dBm levels you can take preventative action to stop a signal and possibly an On-Air or Recording loss. The system is, of course, digital and so the Signal Strength is either just good enough or usually much better than that. When it is no longer strong enough the signal stops.

If introducing new equipment (cameras, switchers, etc.) or new operators be sure to do a test run with everything as it will be during the actual production. Reading this User Guide is a good start but hands-on is the best way to understand how it will and more importantly what to do to insure proper operation.

Be as careful during System tear down as during setup.

7.8 Shutting Down the System

System shutdown is simple. The only cautions relate to the Fiber Cable and to the Camera Remote Control Panel Cable.

Camera Power and Camera Unit Power may be turned off at any time. If your system utilized Hybrid Power these are one and the same.

- To avoid the possibility of looking directly into an active fiber optic port or cable, turn both the Camera Unit and the Base Station off before disconnecting the fiber from either point.

- To avoid the possibility of damaging the Camera or Camera Remote Control Panel turn both the Camera Unit and the Base Station off before disconnecting the Control Cable from the Control Panel, the Base Station, the Camera Unit or the Camera itself.

- Protect all cables from dirt, water entry and being dragged across the ground or other surface.

- When re-spooling the cable take your time so as to avoid cable snags, crimps or damage to the connectors. Re-spool evenly across the reel.

- If the Base Station is a permanent or semi-permanent installation then simply power off and disconnect and cap the Fiber Cable.

7.9 Troubleshooting

Troubleshooting any technical issues with the T-POV Robotic Camera Link System is similar to any piece of television production gear with the obvious exception of the core Fiber Optic technology. Here is a list of things to look out for and check – some of them obvious but sometimes forgotten.

1. Check all your cables – and loss connections or bad connectors?
2. Check your power – are the Power Supplies working?
3. If the Base Station is internally powered is the mains switch on the rear panel turned on?
4. If there is a power problem, check the fuses and if the system is internally powered make sure you are within the 95 Watt limit on power consumption
5. Take advantage of the various diagnostic tools provided in the T-POV Robotic Camera Link Base Station and Camera Unit.
    a. Is the Fiber Optic Signal Strength within an acceptable range? The product specification calls for strength of -22 dBm or greater but the system will often work at strengths lower than this – though not guaranteed to do so – Use the Four Character Digital Displays to check signal strength. Remember to check at both ends, both local and remote power. It is useful to know that the Base Station is putting out good power but the Camera Unit is not receiving it.
    b. Observe all of the LED warning and alarm lights on the Base Station and follow up based on what you observe.
    c. If signal strength is degraded from the time of system checkout at a particular location, walk the Fiber Cable and see that it is in intact and has no damage of severe bends or kinks.
6. If the digital display indicates an error and displays a Hexadecimal error code you should contact Telecast Fiber support to assist in diagnosing the problem. Note the exact error code so you can report it to Telecast Fiber support. The hexadecimal errors indicate problems with the power supplies and the internal boards. In general, there is not much you can do as an end user if one of these rare error messages is displayed.

Appendices

The following appendices are included:

Appendix 1 – Connector Wiring Information

Appendix 2 – Serial data configuration

Appendix 3 – Product ordering/model information

Appendix 4 – Product Specification

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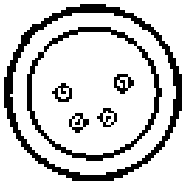
Appendix 1 – Connector Wiring Information

The following wiring diagrams are provided:

1. 12 Volt DC Power Connection
2. 15 Pin Serial Data Connection
3. 26 Pin Serial Data Connection
4. 25 Pin Audio Connection
5. 12 Volt Power Terminal Block

12 Volt DC Power Connection

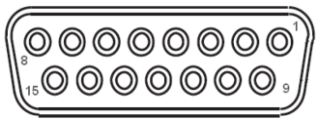


Pin	Function
1	Ground
2	Unused
3	Unused
4	+ Power 12 VDC

Table 3 – T-POV 12 Volt Power Connector Wiring

This matching connector is from either an ADAP-AC-04 or a customer 12VDC power supply

15 Pin Serial Data Connection



Data 1
(1) 232 In
(5) 232 Out

Data 2 Format select switch
00 = **rs422**
11 = **rs485**

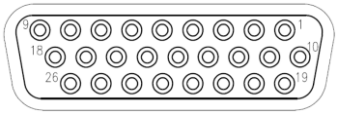
Data 2
(3) +422 In
(2) -422 In
(7) +422 Out, +485 I/O
(6) -422 Out, -485 I/O

Tally
(4) GPI In
(8) GPI Out A
(15) GPI Out B
(9,10,11,12) Ground

Applicable to T-POV 301

For information regarding the Data 2 Format Select Switch please see the Following Appendix.

26 Pin Serial Data Connection



Data 1
(9) 232 In
(18) 232 Out

Data 3
(6) 232 In, +422In, +485 I/O
(15) -422 In, -485I/O
(14) 232 Out, +422 Out
(4) -422 Out
(23) Data 3 Format

Format Pin Orientation
N/C for **rs422**
Tie to Ground For **rs232**
Tie to Format Bias for **rs485**
(20,22,24) Ground
(2) Format Bias (12v)

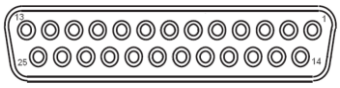
Data 2
(8) 232 In, +422In, +485 I/O
(17) -422 In, -485I/O
(16) 232 Out, +422 Out
(7) -422 Out
(25) Data 2 Format

Data 4
(4) 232 In, +422In, +485 I/O
(13) -422 In, -485I/O
(12) 232 Out, +422 Out
(3) -422 Out
(21) Data 4 Format

Tally
(11) GPI In
(1) GPI Out A
(10) Out B

Applicable to the T-POV 324

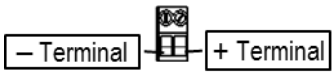
25 Pin Audio Connection



AUDIO 1 IN	AUDIO 2 IN	AUDIO 3 IN	AUDIO 4 IN
(24) + Input	(10) + Input	(21) + Input	(7) + Input
(12) - Input	(23) - Input	(9) - Input	(20) - Input
(25) Ground	(11) Ground	(22) Ground	(8) Ground
AUDIO 1 OUT	**AUDIO 2 OUT**	**AUDIO 3 OUT**	**AUDIO 4 OUT**
(18) + Output	(4) + Output	(15) + Output	(1) + Output
(6) - Output	(17) - Output	(3) - Output	(14) - Output
(19) Ground	(5) Ground	(16) Ground	(2) Ground

Applicable to T-POV 324

Base Station 12VDC Terminal Block Wiring



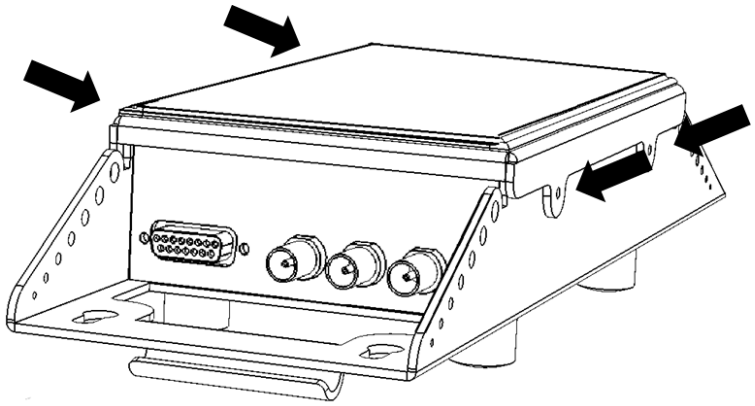
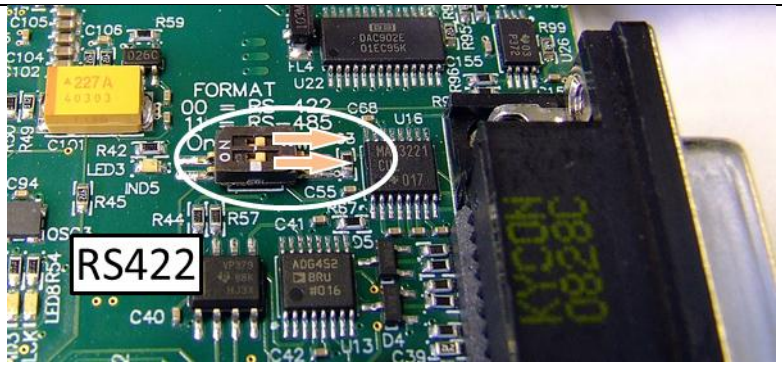
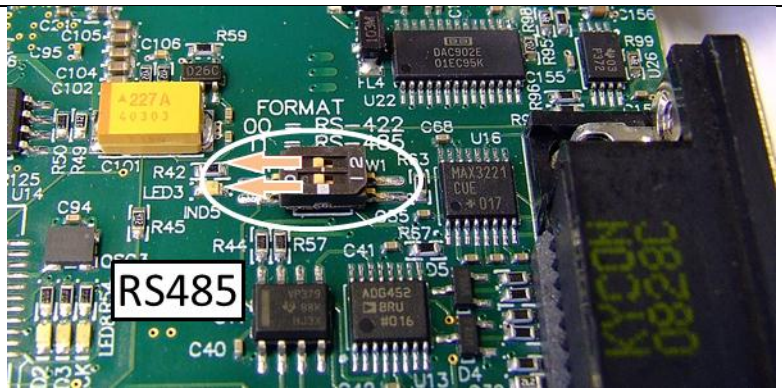
Pin	Function
1	Minus Voltage Terminal
2	Plus Voltage Terminal

Table 4 - Base Station 12VDC Terminal Block Wiring

This cable is end-user supplied

Appendix 2 – Serial Data Configuration

For the Serial Data connector on the T-POV 301 the Data 2 channel is configurable. To select between RS4222 and RS485 serial communication to must select the proper settings on a dual dip-switch contained on the main circuit board inside the unit. The switch is directly behind the right side of the serial connectors on both the base station and the camera unit.

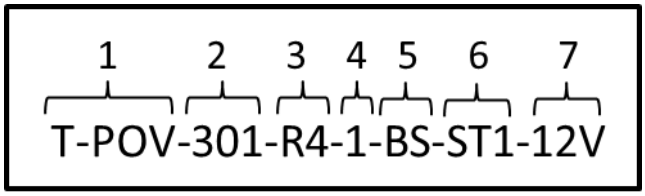
Remove the top of the unit by removing the four screws as shown. A Mini-Mussel Shell Camera Unit is shown as an example.	
For RS422 serial communications slide both switches to the back of the unit (towards the serial connector). For a multi-unit Base Station you must set each unit separately and units can be set differently from each other.	
For R485 serial communications slide both switches to the front of the unit (away from the serial connector). For a multi-unit Base Station you must set each unit separately and units can be set differently from each other.	

Appendix 3 – Product Ordering/Model Information

Below is the list of currently offered T-POV Models. Please check with your Telecast Fiber Representative or Telecast Fiber support for any questions.

Understanding the T-POV Part Number

The Telecast T-POV part number consists of 7 segments:



Each segment represents a parameter describing the particular T-POV unit:

Segment	Description	Example
1	Product Designation	T-POV
2	Model #	301 or 324
3	Physical Configuration	R4 for Rack Mount MML or MMH for Mini-Mussel Shell
4	Base Station or Camera Unit	BS or CA
5	Unit Number (for Rack Unit models only)	1 or 2
6	Connector Type	ST1, ST2, ST4 for ST Fiber Connectors 304M for SMPTE 304M Hybrid Fiber Connector
7	Power Type	12V for external power 95V for internally powered

T-POV Part Numbers Full List

T-POV 301 Variations

Telecast Part No.	Short Description
	Base Stations
T-POV-301-R4-1-BS-ST1-12V	301 1 RU Single Base Station Rack Mount external power with 1 ST connector
T-POV-301-R4-1-BS-ST2-12V	301 1 RU Single Base Station Rack Mount external power with 2 ST connectors
T-POV-301-R4-2-BS-ST2-12V	301 1 RU Dual Base Station Rack Mount external power with 2 ST connectors
T-POV-301-R4-2-BS-ST4-12V	301 1 RU Dual Base Station Rack Mount external power with 4 ST connectors
T-POV-301-R4-1-BS-304M-95V	301 1 RU Single Base Station Rack Mount internal power with 304M connector
T-POV-301-MML-BS-ST1-12V	301 Single Base Station Mini-Mussel Shell external power with 1 ST connector
T-POV-301-MML-BS-ST2-12V	301 Single Base Station Mini-Mussel Shell external power with 2 ST connectors
	Camera Units
T-POV-301-R4-1-CA-ST1-12V	301 1 RU Single Base Station Rack Mount external power with 1 ST connector
T-POV-301-R4-1-CA-ST2-12V	301 1 RU Single Base Station Rack Mount external power with 2 ST connectors
T-POV-301-R4-2-CA-ST2-12V	301 1 RU Dual Base Station Rack Mount external power with 2 ST connectors
T-POV-301-R4-2-CA-ST4-12V	301 1 RU Dual Base Station Rack Mount external power with 4 ST connectors
T-POV-301-MML-CA-ST1-12V	301 Single Base Station Mini-Mussel Shell external power with 1 ST connector
T-POV-301-MML-CA-ST2-12V	301 Single Base Station Mini-Mussel Shell external power with 2 ST connectors
T-POV-301-MMH-CA-304M-95V	301 Single Base Station Mini-Mussel Shell internal power with 304M connector

T-POV 324 Variations

Telecast Part No.	Short Description
	Base Stations
T-POV-324-R4-1-BS-ST1-12V	324 1 RU Single Base Station Rack Mount external power with 1 ST connector
T-POV-324-R4-1-BS-ST2-12V	324 1 RU Single Base Station Rack Mount external power with 2 ST connectors
T-POV-324-R4-2-BS-ST2-12V	324 1 RU Dual Base Station Rack Mount external power with 2 ST connectors
T-POV-324-R4-2-BS-ST4-12V	324 1 RU Dual Base Station Rack Mount external power with 4 ST connectors
T-POV-324-R4-1-BS-304M-95V	324 1 RU Single Base Station Rack Mount internal power with 304M connector
T-POV-324-MML-BS-ST1-12V	324 Single Base Station Mini-Mussel Shell external power with 1 ST connector
T-POV-324-MML-BS-ST2-12V	324 Single Base Station Mini-Mussel Shell external power with 2 ST connectors
	Camera Units
T-POV-324-R4-1-CA-ST1-12V	324 1 RU Single Base Station Rack Mount external power with 1 ST connector
T-POV-324-R4-1-CA-ST2-12V	324 1 RU Single Base Station Rack Mount external power with 2 ST connectors
T-POV-324-R4-2-CA-ST2-12V	324 1 RU Dual Base Station Rack Mount external power with 2 ST connectors
T-POV-324-R4-2-CA-ST4-12V	324 1 RU Dual Base Station Rack Mount external power with 4 ST connectors
T-POV-324-MML-CA-ST1-12V	324 Single Base Station Mini-Mussel Shell external power with 1 ST connector
T-POV-324-MML-CA-ST2-12V	324 Single Base Station Mini-Mussel Shell external power with 2 ST connectors
T-POV-324-MMH-CA-304M-95V	324 Single Base Station Mini-Mussel Shell internal power with 304M connector

Appendix 4 – Product Specification

Not all specification items apply to every model. Please see the above User Guide to determine which functions apply to your unit. As an example audio and Ethernet only apply to certain models. Please see the Signal Path list on Page 19.

Video, Digital

Interface.....SMPTE 259M, 292M
Data Rate.....270 Mb/s or 1.5 Gb/s
Input Level..... 800mV (peak to peak)
Input Impedance.....75 Ohms
Output Impedance .....75 Ohms
Bit-Error Rate (@ -22 dBm)..... 10-12
Jitter Measure w/Color Bars .....<0.2 UI
Rise/Fall Times .....0.4ns-1.5ns SD
.....<270ps HD

Video Analog

Interface..... RS170, NTSC, PAL, SECAM
Input/Output Level .....1V p-p @ 75Ω
Frequency Response ……..... 30Hz-5 MHz±0.2 dB
.....-3dB point min8.6 MHz
Video Signal to Noise Ratio…….…….....≥ 67 dB, weighted
Differential Gain.....<= 2.0%
Differential Phase ..... <= 0.7o
Line Time Distortion..... <= 0.5 IRE
Chrom-Lum Intermod ..... <= 1 IRE

Ethernet (T-POV 324 only)

Data Support 10BaseT/100BaseT
Connector .....Twisted Pair RJ45
Cable Compatible.....UTP 100-ohm Cat5e Cat6
Input Impedance..... 100Ω differential
Output Impedance ..... 100Ω differential

Audio (T-POV 324 only)

Number of Channels.....4 In/4 Out
Type.....Balanced, line level
Impedance Input/Output .....>10K Ω/30 Ω
Maximum Input Level ..... +24 dBu
Quantization ..... 24 bits, 12.8x (oversampled)
Sample Rate.....48KS/sec
Frequency Response ……..±0.1 dB, 20 Hz to 20 KHz
Signal to Noise Ratio .....< -95dB (A-Weighted)
THD+N..... 20Hz-20KHz.<= 0.02%
Interface.....DB25 (Tascam standard pin out)

Data Auxiliary

RS422/RS485.....0 to 1 Mbaud
RS232.....0 to 150 Mbaud
Number of Channels.....2-6 Channels
Sample 80nSec
GPI Contacts ..... NO, Form 1 SPST

Electro-Optical

Operating Wavelengths .....1300 nm standard
.....1550 nm, CWDM wavelengths available
TX Laser output power (std./opt)……6 dBm/0 dBm
RX Sensitivity, HD/SDI..... -22 dBm
Fiber Compatibility... .....Single Mode

Distance Limit *see note below
Tactical Fiber (Local Power at Camera):
Standard laser …….... 15db optical loss (≈ 30 km*)
Optional DFB laser ..... 19db optical loss (≈ 38 km*)
SMPTE 311M Hybrid Fiber.....240m (787 ft): 95W @ 12VDC*

Optical Connector Options
Local Power.....ST
Remote Power……...SMPTE 304M

Mechanical/Environmental

Dimensions (LxWxD):
Rack Mounted Units (w/ears) …….. 8" x 19" x 1.75"
Mini-Mussel Low Profile……12.75" x 5.25" x 2.75"
Mini-Mussel High Profile..... 12.75" x 5.25" x 4"

Weight
Rack Mounted Unit - 12VDC
Single/Dual .....5.0/5.75/lb.
Rack Mounted Unit …… AC for SMPTE Power ..6.5 lb.
Mini-Mussel Low Profile.....2 lb.
Mini-Mussel High Profile.....3.5 lb.

Humidity..... 0 to 95% RH, Noncondensing
Certifications……....FCC Part 15, RoHS, LEED, CE
Temperature Range……..... Operating -25° C to +55°C

* The maximum cable length varies due to optical loss that can depend on cable quality, dirt/dust/contamination on connectors, and number of fiber interconnects. When using hybrid cable for power, the size of the hybrid cable, as well as the power draw of the camera, lens, and pan/tilt head are also factors.

END PAGE