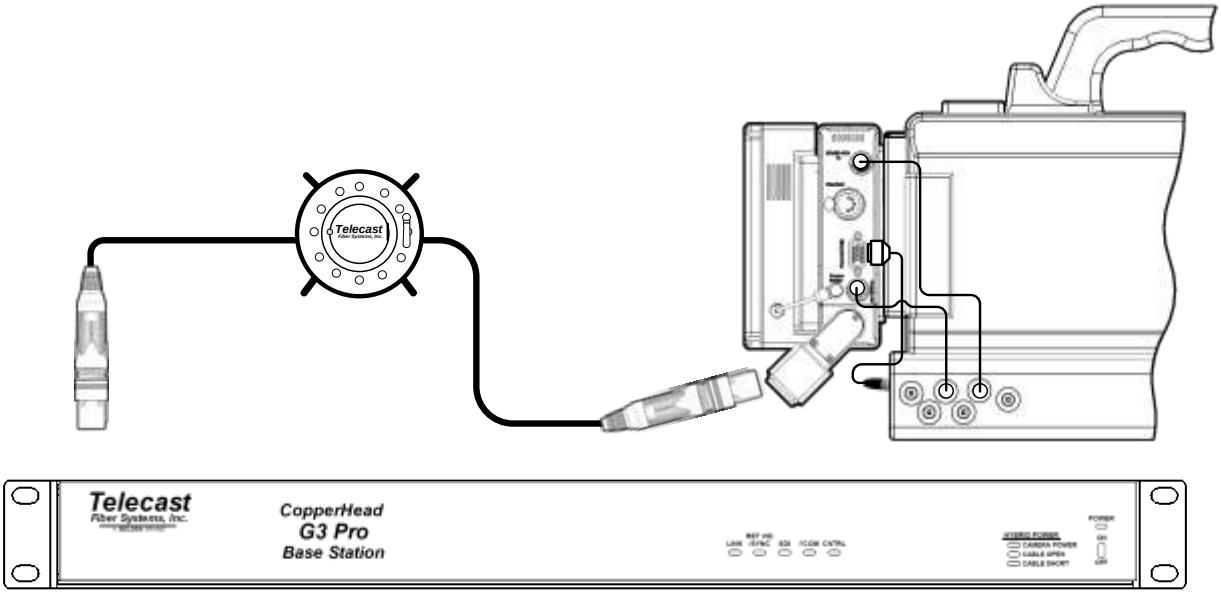
Telecast Fiber Systems, Inc.

A **BELDEN** Brand

CopperHead™ Pro

Camera-Mountable Fiber Optic Transceiver System

User Manual



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About this User Guide

There are innumerable CopperHead Pro options and permutations, 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.

Pointer	Meaning
	Caution: The information provided is important safety information and should be understood and followed in order to operate the CopperHead Pro Fiber Optic Transceiver System safely and properly.
	Take Note: Useful information regarding the User Guide and the CopperHead Pro Fiber Optic Transceiver System. Reading and understanding this information will make using the manual and the product easier.

Chapter 1 - Important Information

1.1. Warranty

LIMITED WARRANTY STATEMENT

Telecast Fiber Systems, Inc. (“Telecast”) 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”). Telecast'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 Telecast Fiber Systems, 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 which 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 Telecast of the defect prior to the expiration of the applicable warranty period and obtain a Return Authorization Number from Telecast. In no event may products be returned to Telecast or to Distributor for warranty service without having obtained from Telecast 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 Telecast Fiber Systems, 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 Telecast Fiber Systems, Inc. without the consent of Telecast Fiber Systems, 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 Telecast’s 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 Telecast personnel.

Products returned to Telecast for warranty service shall be shipped, freight prepaid to Telecast. Telecast 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 Telecast’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 Telecast Fiber Systems, Inc., but 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 Telecast Fiber Systems, Inc.

EXCEPT FOR THE EXPRESS LIMITED WARRANTY AGAINST DEFECTS IN MATERIALS AND WORKMANSHIP CONTAINED HEREIN, TELECAST FIBER SYSTEMS, 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 TELECAST FIBER SYSTEMS, INC. THIS LIMITED WARRANTY SETS FORTH EXCLUSIVELY ALL OF TELECAST FIBER SYSTEMS, INC.'S LIABILITY IN CONTRACT OR OTHERWISE IN THE EVENT OF A DEFECTIVE PRODUCT. WITHOUT LIMITATION ON THE FOREGOING, TELECAST FIBER SYSTEMS, 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 TELECAST HAS BEEN GIVEN ADVANCE NOTICE OF THE POSSIBILITY THEREOF

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

1.2. Safety and Fiber Optic Systems

1.2.1. 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 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.

1.2.2. Power Fuses

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The CopperHead Pro AC-powered Base Stations (models CHG3-BS-PRO-95VD-XXX-XXX) are equipped with two fuses located next to the AC Power receptacle at the left rear of the unit. Refer to Appendix C.2.a. for specific fuse and location information.

NEVER operate the CopperHead CHG3-BS-PRO-95VD-XXX-XXX 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 and the CopperHead Pro Transceiver System

Individual items shipped with a CopperHead Pro system depend on the particular configuration
.

Item Description	Part Code	CopperHead System Type		
		Tactical Fiber (local power at camera)	Hybrid Fiber - Standard Power (PowerWafer)	Hybrid Fiber - High Power (PowerPlus)
CopperHead Camera Unit	CHG3-CAM	●	●	●
CopperHead Base Station	CHG3-BS	●	●	●
AC-to-DC Power Supply	ADAP-AC	●	No	No
Panel-Mountable Fiber Extension	CH3BFC	O	O	No
Camera Remote cable	CHCR	●	●	●
Camera Signal cable	CH3CS	O	O	O
Base Station Remote cable	CHBR	●	●	●
PowerWafer w/jumper cable	CHG3-PW	No	●	No
Eternal PowerWafer Supply	CH3-MPS	No	O	No
PowerPlus	PWRPLS	No	No	●
HDX Power Supply	HDX	No	No	●
Fiber jumper(s)	various	No	No	●
Reel or coil of Tactical Fiber	CA	●	No	No
Reel or coil of Hybrid Fiber	CA	No	●	●
Operations Manual	CA	●	●	●

● Standard O Optional

Table 1 - What is typically shipped with a CopperHead Pro 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, Tally, Black Burst/Genlock, Base Station monitor, intercom, and other ancillary signals and equipment. Suggestions for these cables are discussed later in this User Guide.

1.4. Product Returns

In the unlikely event of damage to your CopperHead Pro Fiber Optic Transceiver 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.

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Chapter 2 – System Overview

The Telecast CopperHead Pro System is a fiber optic transmission system that enables camcorders to be used in live, multi-camera production environments.

The system uses a fiber optic cable to transport a variety of signals between a Camera Unit and a Base Station.

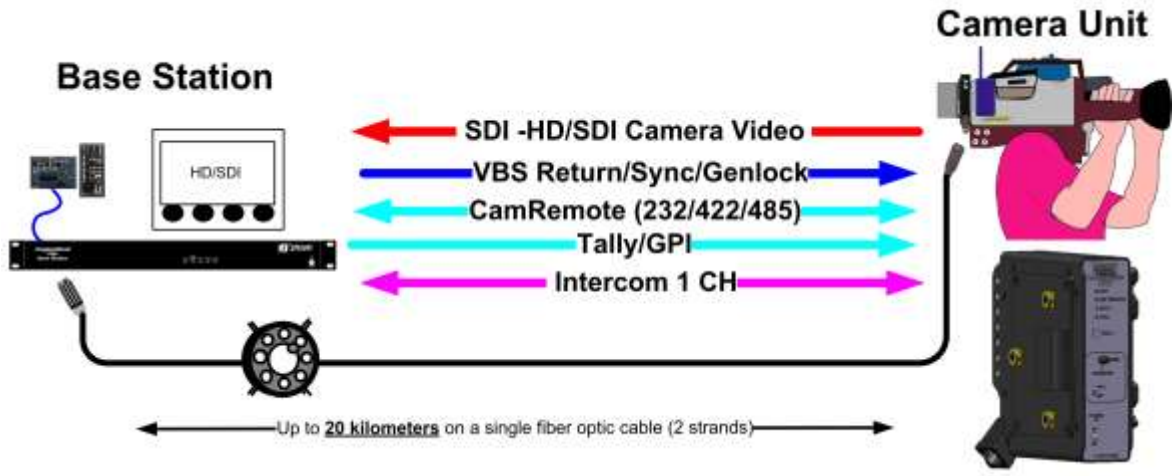


Figure 1 - CopperHead Pro Signal Paths

The CopperHead Pro Camera Unit is typically mounted to a camera that is placed in a studio, theatre, sports venue, or other live-event location. The system's Base Station is usually located in a truck, control room or other video production control area.

When "dry" fiber is used (typically lightweight "tactical" fiber cable), the signals are transmitted bi-directionally, over distances as long as 5 km or more.

When hybrid fiber cable is used, the link also provides power to the Camera Unit and the camera itself.

2.1. CopperHead Pro System Features

- The system makes any camcorder practical for multi-camera production.
- All camera signals are carried on one lightweight fiber cable.
- Can be run through building or campus infrastructure on two strands of Single Mode fiber.*
- Thin, lightweight, modular design.
- Studio quality uncompressed HD/SDI video up to 3 Gb/s.
- Multi-kilometer distance capability
- Anton/Bauer® Gold Mount and "V-Mount" battery options
- Wide temp range, low power consumption
- Two fiber cable options
    - Tactical Fiber
        - — Military Spec, battery/local power, 10+km
    - SMPTE Hybrid Fiber
        - — Low voltage camera-mounted "PowerWafer" —
            - 95 watts to 300m (984 ft.)
        - — High-voltage camera-mounted "PowerPlus"
            - Up to 150 watts to 2 km (1.2 miles)
- Durable, high reliability design

***NOTE: The CopperHead Pro System is not readily compatible with active or passive CWDM multiplexing technologies, including Telecast's Teleport or TeleThon systems.**

2.2. CopperHead Pro System Configurations

The CopperHead Pro system is available in a variety of configurations that maximize the advantages of either “dry” fiber cable, “hybrid” fiber cable, or a combination of the two.

2.2.1. “Dry” Fiber Systems – Locally powered cameras

CopperHead Pro systems can be run on “dry” fiber optic cable, typically tactical fiber optic cable or infrastructure fiber. These “dry” cable runs do not provide power from Base Station to Camera Unit, so the camera and CopperHead Camera Unit must be powered locally, typically by a battery.

In “Dry” fiber configurations, Camera Unit, Base Station and Tactical Fiber cable can be equipped with one of two types of fiber connectors:

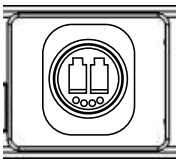
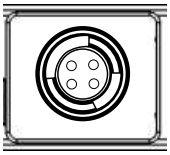
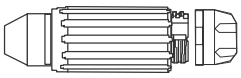
Panel Connectors		Cable Plugs	
OpticalCON (dry)	MX	OpticalCON (dry)	MX
			

Figure 2 - "Dry" fiber connectors

2.2.1.1. Tactical Fiber, Direct to Base Station

When connected directly to a Base Station using tactical fiber, the system is typically configured as shown in Figure 3, and uses the following components:

- Ⓐ Camera Unit
- Ⓑ DC powered Base Station
- Ⓒ Battery or Local Power Source
- Ⓓ CHCR camera remote cable
- Ⓔ CHBR base remote cable
- Ⓕ Hybrid fiber optic cable
- Ⓖ ADAP 12VDC Power Supply

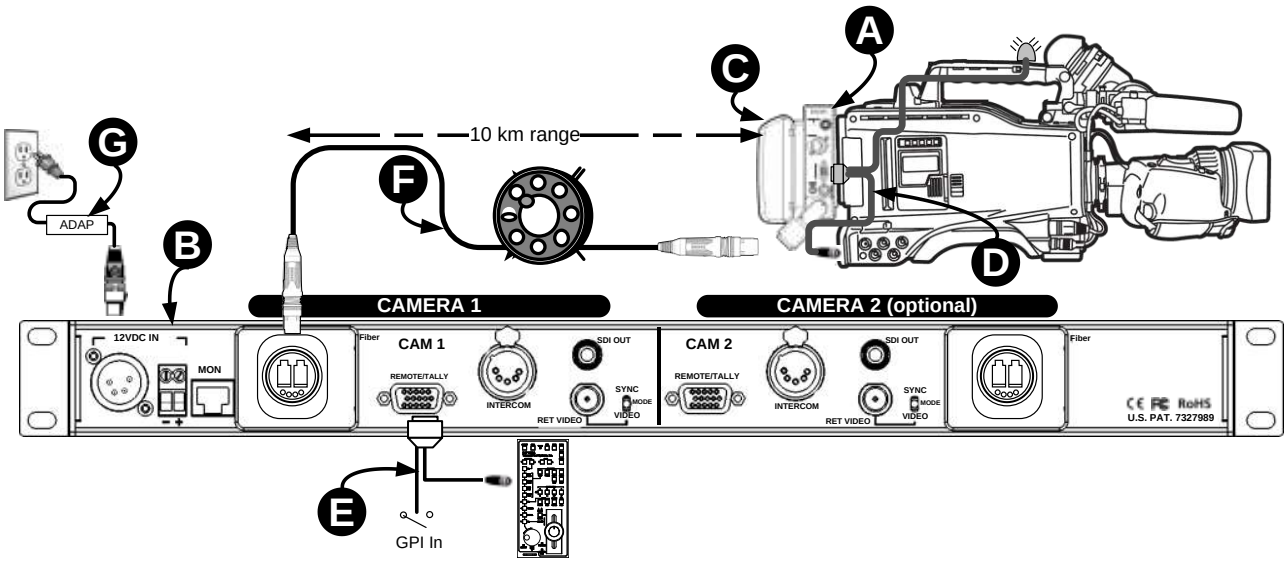


Figure 3 - Direct to Base Station, Tactical Fiber

2.2.1.2. Tactical Fiber, Remote Fiber Connector

It is often desirable to position a panel-mounted fiber connector in a wall plate, flypack, or vehicle access panel at some distance from Base Station. Breakout cables with panel-mountable receptacles are available, and can be connected directly to a Base Station using tactical or infrastructure fiber. The system is typically configured as shown in Figure 4, and uses the following components:

- Ⓐ Camera Unit
- Ⓑ Battery or local Power Supply
- Ⓒ CHCR camera remote cable
- Ⓓ DC-powered Base Station with ST fiber connectors
- Ⓔ CHBR Base Remote cable
- Ⓕ Remote panel-mountable fiber extension cable or fiber optic infrastructure (ST connectors at one end)
- Ⓖ Tactical fiber optic cable
- Ⓗ ADAP 12VDC power supply

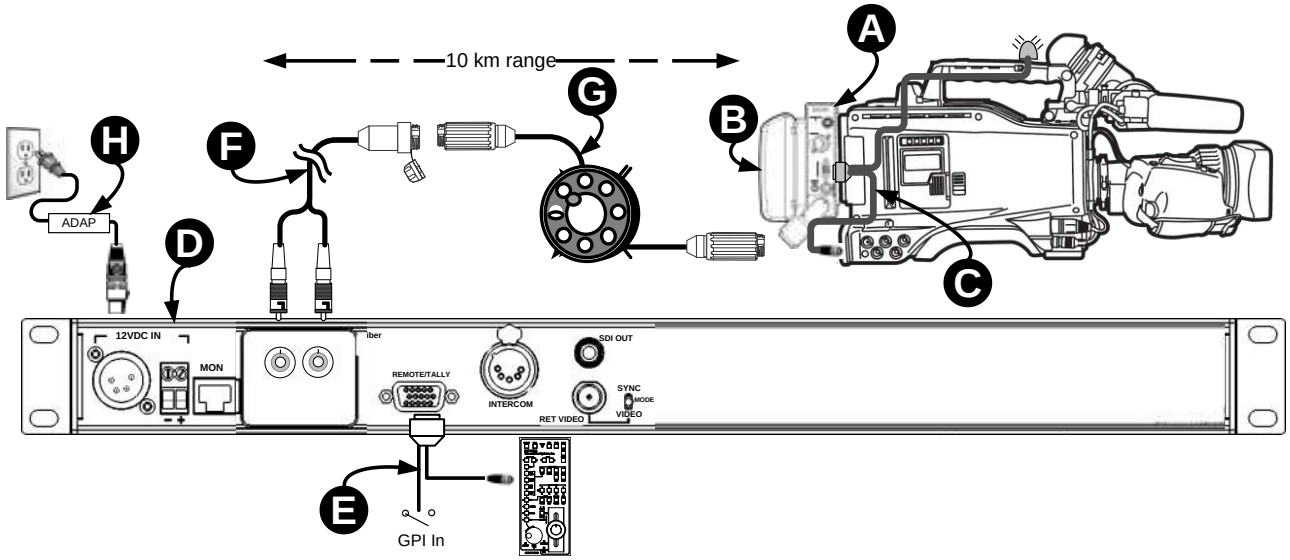


Figure 4- Base Station Extension, Tactical Fiber

2.2.2. Powered Systems using the PowerWafer

CopperHead Pro Base Stations can be equipped with an internal power supply that, when used with SMPTE hybrid fiber cable and a PowerWafer at the Camera Unit, will deliver approximately 95 Watts of power to the camera and related accessories.

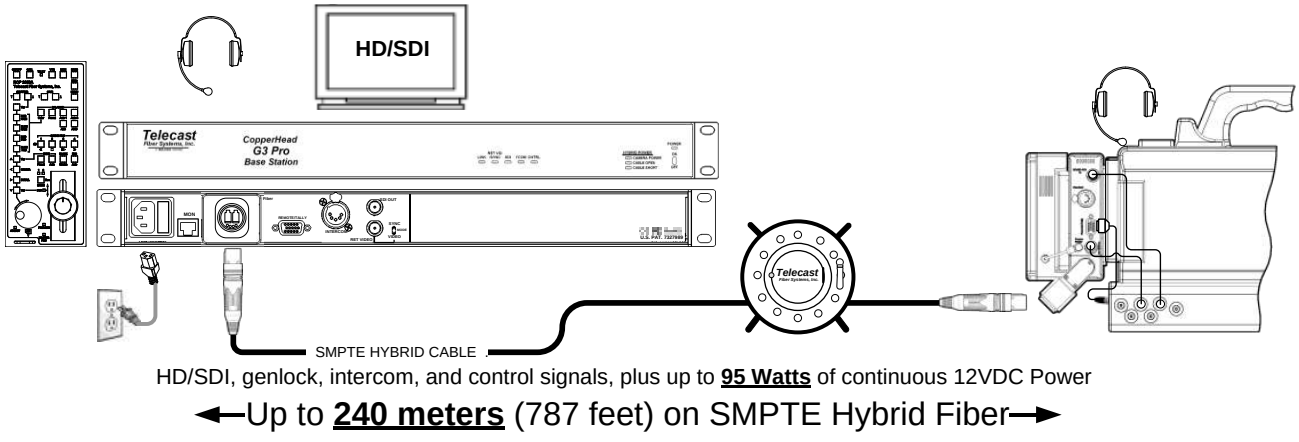


Figure 5 - Powered System Overview

The maximum range of the system is nominally 240 meters (787 feet)* when drawing 95 watts at the camera, but distances will vary depending on total power draw at the PowerWafer, as shown in Figure 6.

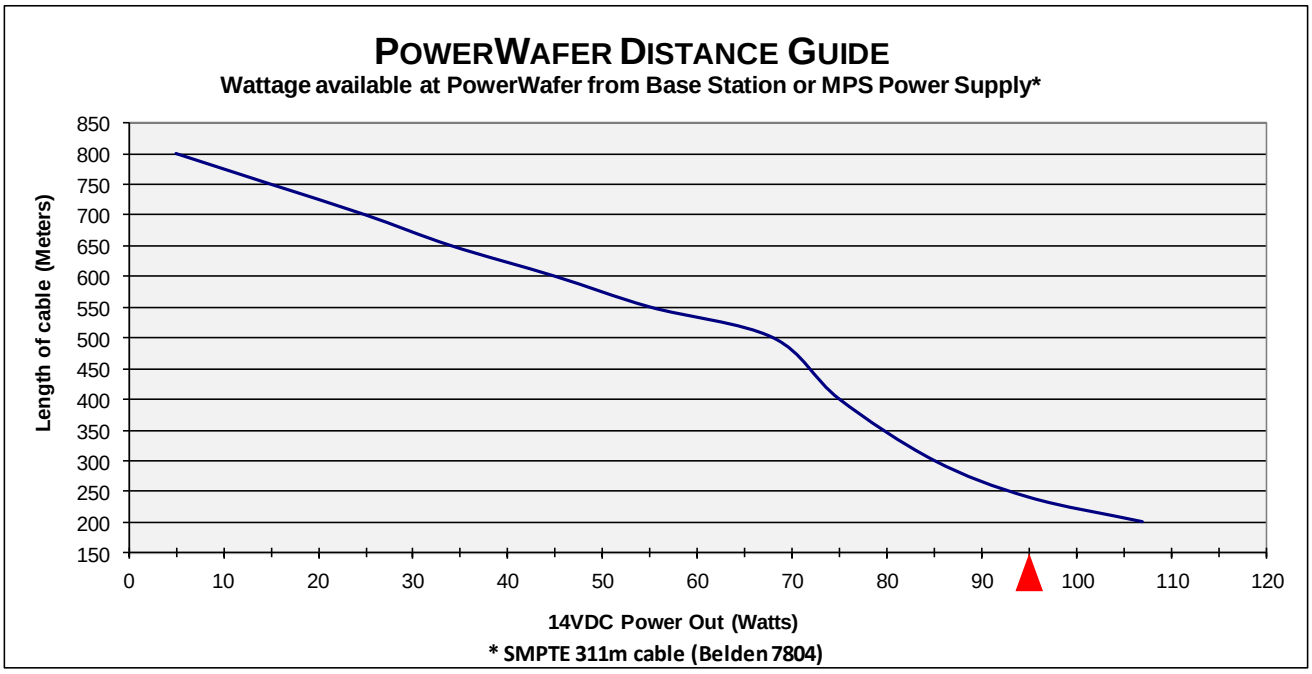


Figure 6 - PowerWafer Distance Chart

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

In powered fiber configurations, the Camera Unit, Base Station and hybrid fiber cable can be equipped with one of two types of fiber connectors:

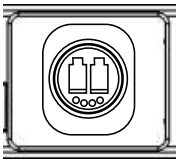
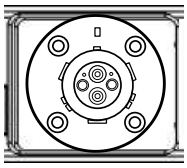
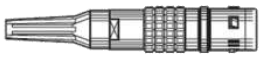
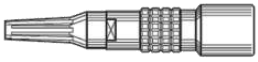
Panel Connectors		Cable Plugs	
OpticalCON	SMPTE 304M	OpticalCON	SMPTE 304M
			Male  Female 

Figure 7 - Hybrid Copper/Fiber Connectors

2.2.2.1. PowerWafer, Direct to Base Station

When connected directly to an AC-powered Base Station using SMPTE hybrid fiber cable, the system delivers up to 95 watts of power to the camera and accessories. Such a system is typically configured as shown in Figure 8, and includes the following components:

- Ⓐ Camera Unit
- Ⓑ AC-powered Base Station with internal camera power supply
- Ⓒ PowerWafer
- Ⓓ CHCR camera remote cable
- Ⓔ CHBR base remote cable
- Ⓕ Hybrid fiber optic cable

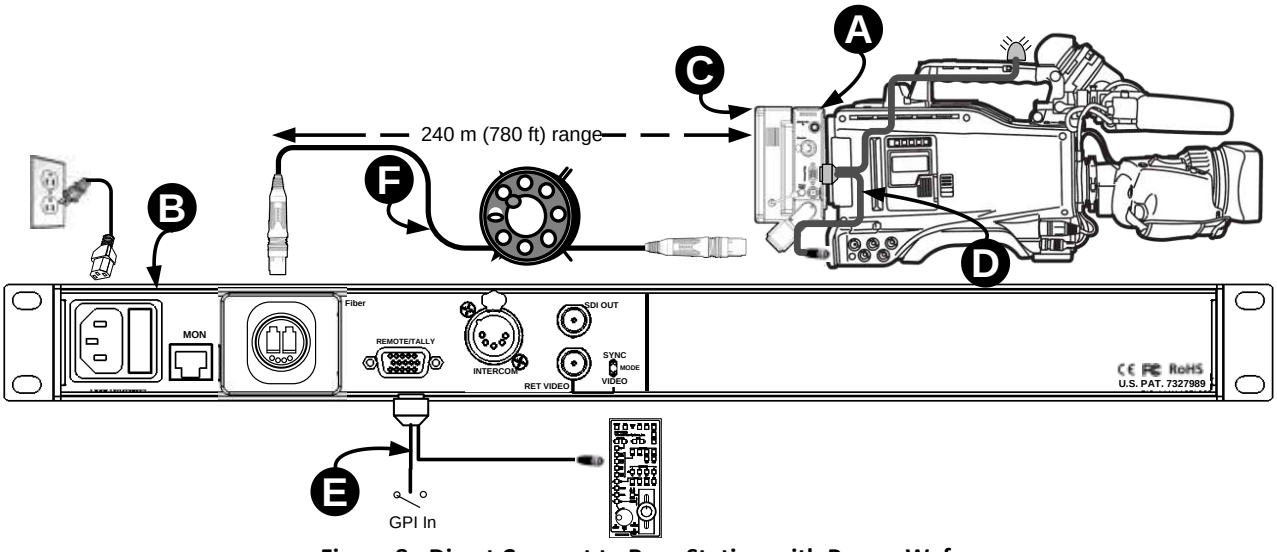


Figure 8 - Direct Connect to Base Station with Power Wafer

2.2.2.2. Power Wafer, Remote Panel-Mounted Fiber Connector

The hybrid fiber receptacle may be mounted a distance from the Base Station if the station is equipped with a pair of inexpensive ST fiber connectors and a Molex receptacle to carry power, as shown in Figure 9. A breakout cable can be used to connect the hybrid fiber receptacle to Base Station, or infrastructure wiring can be used.

- Ⓐ Camera Unit
- Ⓑ Power Wafer
- Ⓒ CHCR camera remote cable
- Ⓓ AC-powered Base Station with internal camera power supply.
- Ⓔ CHBR base remote cable
- Ⓕ ST & Molex breakout cable or campus/building infrastructure
- Ⓖ Hybrid fiber optic cable

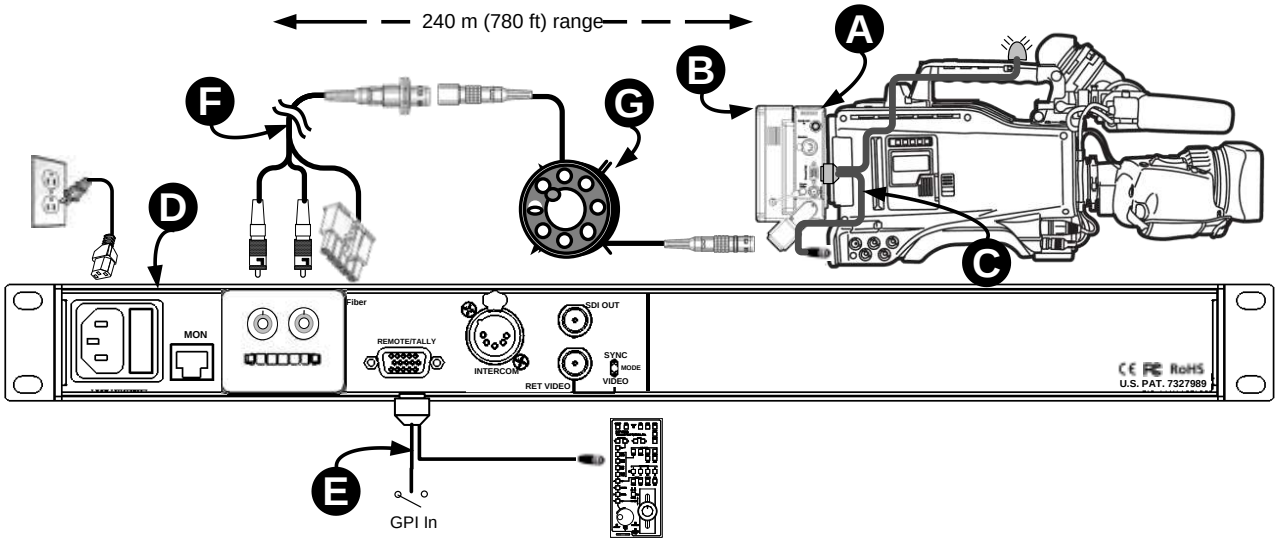


Figure 9 - Powered Base Station with Fiber Receptacle Extension

2.2.2.3. PowerWafer, with MPS Power Supply

Systems can be configured so that the majority of the fiber run is made via “dry” tactical or infrastructure fiber, after which a “throwdown” MPS Power Supply is placed in line to provide powered SMPTE hybrid fiber cable to the camera. In this configuration, as shown in Figure 10, the Base Station can be separated from the MPS power supply by more than nine kilometers (5.6 miles), where powered cable can be run to the camera for 240 meters (780 feet), providing up to 95 watts of power to the camera and accessories.

- Ⓐ Camera Unit
- Ⓑ PowerWafer
- Ⓒ CHCR camera remote cable
- Ⓓ DC-powered Base Station
- Ⓔ CHBR base remote cable
- Ⓕ Tactical fiber or Infrastructure fiber run
- Ⓖ MPS Power Supply
- Ⓗ Hybrid fiber optic cable
- Ⓘ ADAP 12VDC power supply

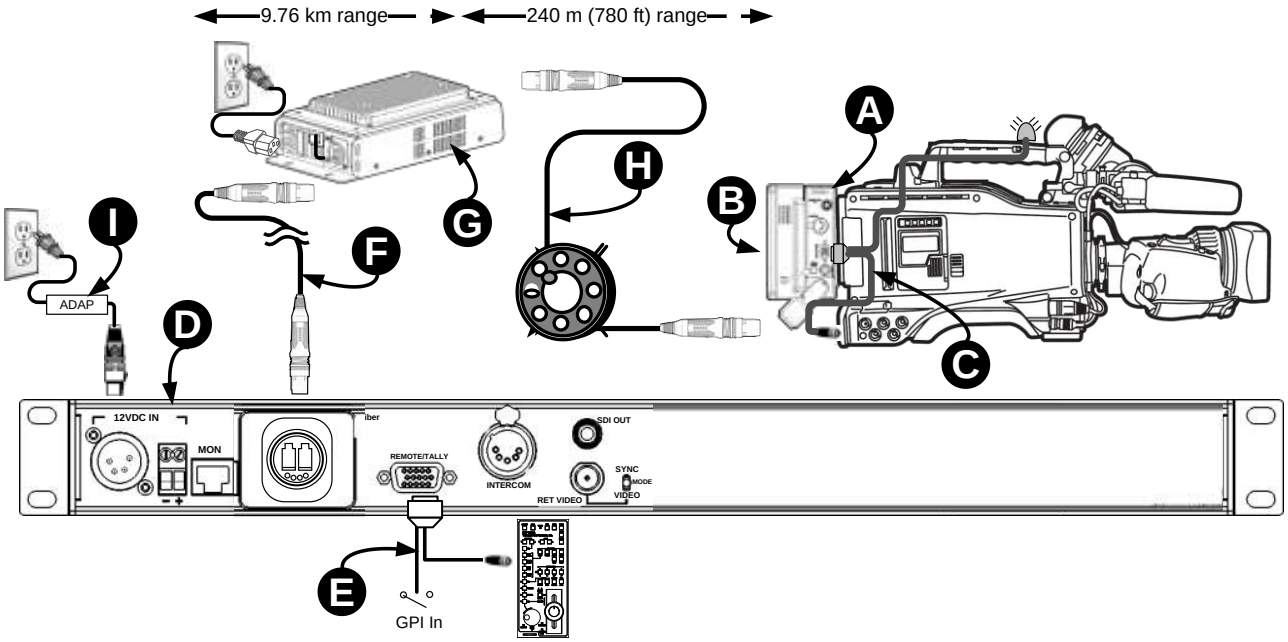


Figure 10 - System using MPS Power Supply

2.2.3. PowerPlus – High Power/Long Distance with HDX Power Supply

When power needs to be run for distances exceeding 240 meters or power requirements exceed 95 watts for the camera and accessories, the external HDX power supply and PowerPlus may be utilized. The PowerPlus can deliver up to 150 watts of power to the camera and accessories.

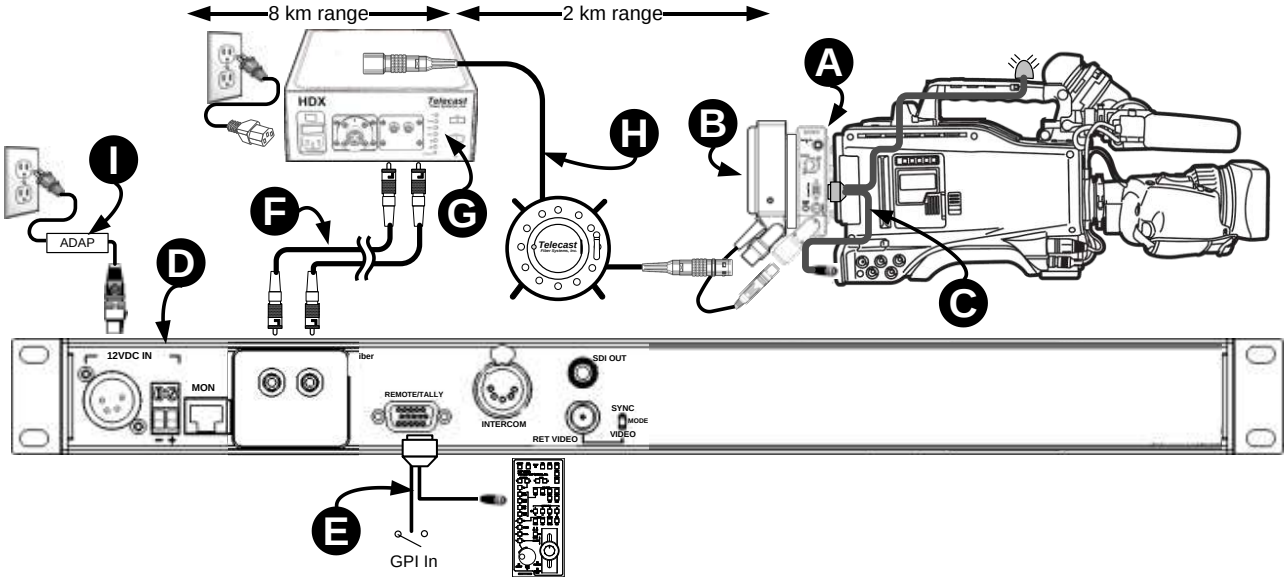


Figure 11 –System Using PowerPlus and HDX

The first part of the fiber run can be made via "dry" tactical or infrastructure fiber, after which the HDX power supply is placed in line to provide powered SMPTE hybrid fiber cable for the camera.

Such a system is typically configured as shown in Figure 8 and includes the following components:

- Ⓐ. Camera Unit
- Ⓑ. PowerPlus
- Ⓒ. CHCR camera remote cable
- Ⓓ. DC-powered Base Station*.
- Ⓔ. CHBR base remote cable
- Ⓕ. Tactical fiber or Infrastructure fiber run
- Ⓖ. HDX Power Supply
- Ⓗ.SMPTE 311M hybrid fiber optic cable*
- Ⓘ. ADAP 12VDC power supply

The Base Station can be separated from the MPS power supply on "dry fiber" (Ⓕ) by more than nine kilometers (5.6 miles) , where powered hybrid cable (Ⓗ) can be run to the camera for another 2 kilometers (1.2 miles).

2.3. CopperHead Pro Transceiver System Components

2.3.1. Camera Unit Overview

The CopperHead Pro Camera Unit fits between the battery or optional power supply and the camera. The Camera Unit is configured at time of purchase with mounting plates to accommodate the appropriate camera battery type.

The camera battery or optional power source attaches to Camera Unit, which in turn, attaches to the video camera. Batteries accommodated are Anton/Bauer Gold Mount and Sony "V" Mount. Other camera mounting plates may be available by special order. Please contact Telecast Fiber Systems or your authorized dealer.

The Camera Unit is equipped with a swivel-mounted fiber optic connector, which can be ordered with an OpticalCON, MX or SMPTE 304M connector. For more information, see Section 3.1.2.2.

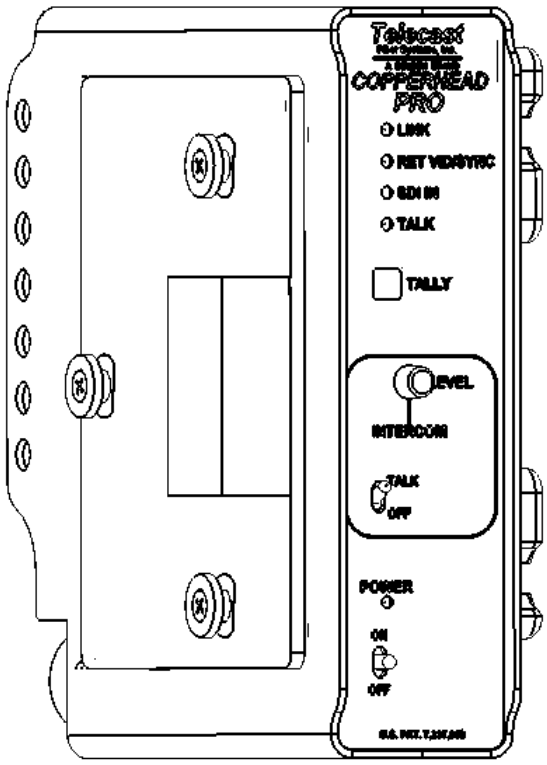


Figure 12 - Camera Unit Front
(attaches to the camera)

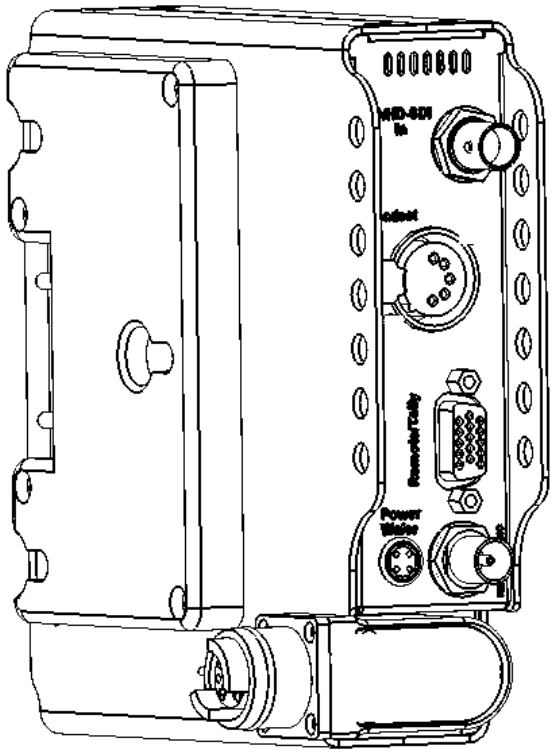


Figure 13 – Camera Unit Rear
(attaches to the battery or power supply)

The actual appearance of your CopperHead Pro Camera Unit will vary depending on the battery mount and fiber cable connector options specified at the time of purchase.

2.3.2. Base Station Overview

The CopperHead Pro Base Station is a one rack-unit high device that provides all of the inputs for signals going to the CopperHead Pro Camera Unit, as well as the outputs for the signals coming from Camera Unit. Base Station is available in a variety of configurations. The options are:

<table>
<tr><th>Power Supply</th><th>Single or Double</th><th>Fiber Connector</th></tr>
<tr>
<td rowspan="7">12 Volt DC Input: “Dry Fiber”
No Internal camera power supply
Does not supply power to Camera Unit via SMPTE hybrid fiber cable
Is typically used with Tactical fiber cable and/or infrastructure cabling
Available in “Dual” configuration for interface and control of two Camera Units in a single one RU device.

120/220 Volt AC Input – “Powered Fiber”
Includes internal power supply for Camera Unit.
Supplies power to Camera Unit via SMPTE hybrid fiber cable
Not available in “Dual” configuration. Can only interface and control a single Camera Unit.</td>
<td rowspan="7">Single Configuration
Interface and control a single Camera Unit.
Available in 12 Volt DC and 120/220 VAC models

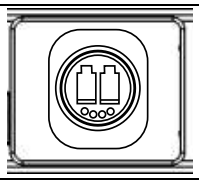
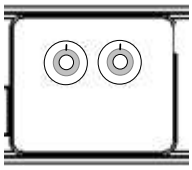
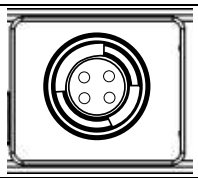
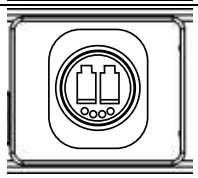
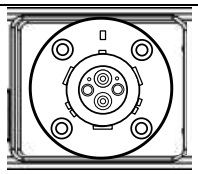
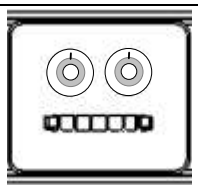
Dual Configuration
Interface and control two Camera Units in a one RU device.
Available in 12 Volt DC only.
Not available for 120/220 VAC models</td>
<td colspan="2">Six different fiber connectors are available for the CopperHead Pro Base Station:</td>
</tr>
<tr><td>OpticalCON (dry)</td><td>  </td></tr>
<tr><td>Two STs</td><td>  </td></tr>
<tr><td>MX (Expanded Beam)</td><td>  </td></tr>
<tr><td>OpticalCON (powered)</td><td>  </td></tr>
<tr><td>SMPTE 304M</td><td>  </td></tr>
<tr><td>Two STs and Molex</td><td>  </td></tr>
<tr><td colspan="2">See Section 3.2.2.2. for details.</td></tr>
</table>

Figure 14 – Single "Dry" Base Station - Front Panel

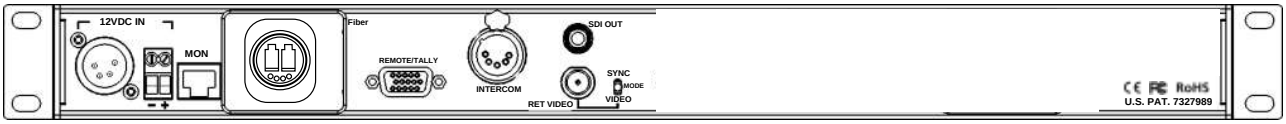


Figure 15 – Single "Dry" Base Station - Rear Panel

Figure 16 - Dual Unpowered Base Station - Front Panel

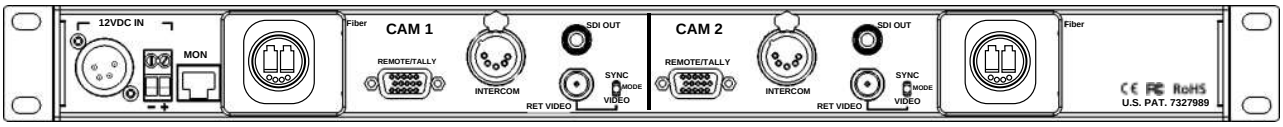


Figure 17 – Dual Unpowered Base Station – Rear Panel

Figure 18 - Powered Base Station - Front Panel

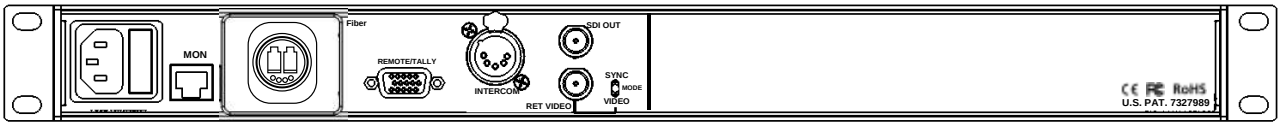


Figure 19 - Powered Base Station - Rear Panel

The actual appearance of your CopperHead Pro Base Station will vary depending on the fiber cable connectors and power option specified at the time of purchase.

Chapter 3 – CopperHead Pro System Components

3.1. Camera Unit

3.1.1. Camera Unit - Front Side

The front of the CopperHead Pro Camera Unit has four areas of interest:

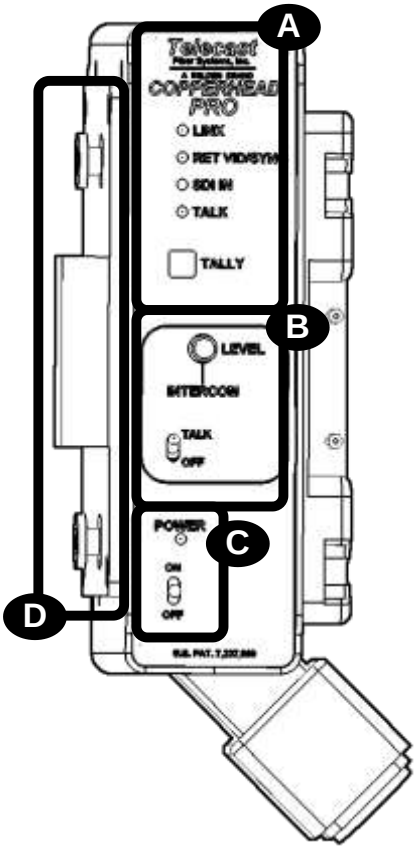


Figure 20 - Camera Unit - Front Side

Ⓐ Signal Status Panel
Indicates the status of the various signals coming to and being sent from the Camera Unit. See Section 3.1.1.1. .

Ⓑ Intercom Controls
Controls for intercom "talk" and "listen" functionality. See Section 3.1.1.2.

Ⓒ Power Switch and Indicator
Controls for power to the Camera Unit. See Section 3.1.1.3.

Ⓓ Camera Mounting Plate
Mechanical mounting hardware for affixing CopperHead Camera Unit to a camera or camcorder. See Section 3.1.1.4.

3.1.1.1. Camera Unit – Signal Status Panel (Section A)

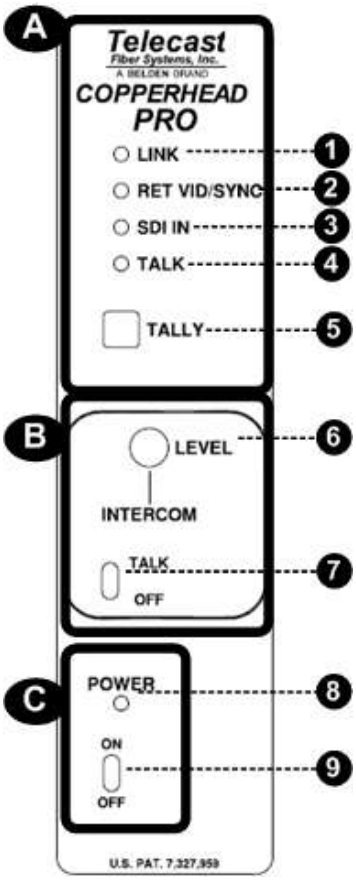


Figure 21 - Camera Unit Signal Status Indicators

❶ **Link**
Indicates the status of the data link from Base Station to Camera Unit. This is a good indicator of optical link.
GREEN when Camera Unit has a data "lock" with Base Station.
RED when Camera Unit is not "locked" to Base Station.

❷ **Return Video/Sync**
Indicates the presence of the composite video signal (VBS) sent from Base Station to Camera Unit. This VBS can be used for return "program" video or for genlock to the camera.

❸ **SDI in**
Illuminates GREEN to indicate the presence of digital SDI video at Camera Unit's input BNC.

❹ **Talk**
Illuminates GREEN to indicate that the intercom "TALK" switch (see 7, below) is in the "Talk" position, and that the headset mic is open.

❺ **Tally**
Illuminates RED when GPI/Tally signal is activated at Base Stations
For suggestions on connecting Tally in your system please see Section 5.2.

3.1.1.2. Camera Unit – Intercom Controls (Section B)

❻ **Headset Level Knob**
Controls volume of the intercom channel in the headset

❼ **Intercom Talk Switch**
"TALK" (up) opens the headset mic
"OFF" (down) closes the headset mic

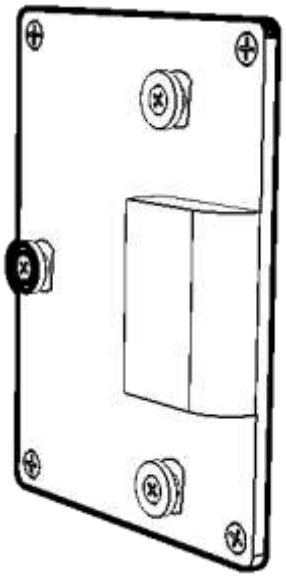
3.1.1.3. Camera Unit – Power Switch & Indicator (Section C)

❽ **Power Indicator**
Illuminates **GREEN** to indicate main power is on.

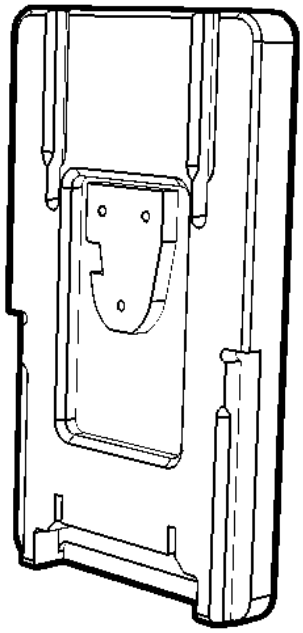
❾ **Power On/Off**
Turns the main power supply on and off

3.1.1.4. Camera Unit – Camera Mounting Plate (Section D)

This plate is used to mount the CopperHead Pro Camera Unit to a camera or camcorder. Camera Unit is typically shipped with an Anton/Bauer "Gold Mount" or Sony-style "V-Mount" camera mounting plate. Other camera mounting plates may be available by special order. Please contact Telecast Fiber Systems or your authorized dealer



Anton Bauer Camera Mounting Plate



V-Mount Camera Mounting Plate

Figure 22 - Camera Unit: Camera-side mounting plates

3.1.2. Camera Unit – Rear Side

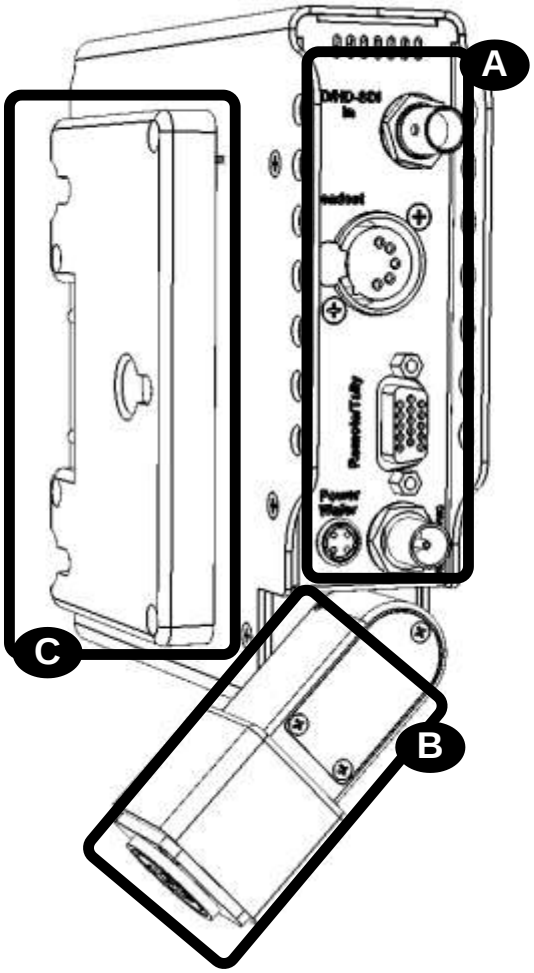


Figure 23 - Camera Unit Back Side

The back side of Camera Unit has three areas of interest:

Ⓐ **Connector Panel**
See Section **Error! Reference source not found.**

Ⓑ **Fiber Connector/Swivel**
See Section **Error! Reference source not found.**

Ⓒ **Battery Mount**
See Section **Error! Reference source not found.**

3.1.2.1. Camera Unit - Connectors (Section A)

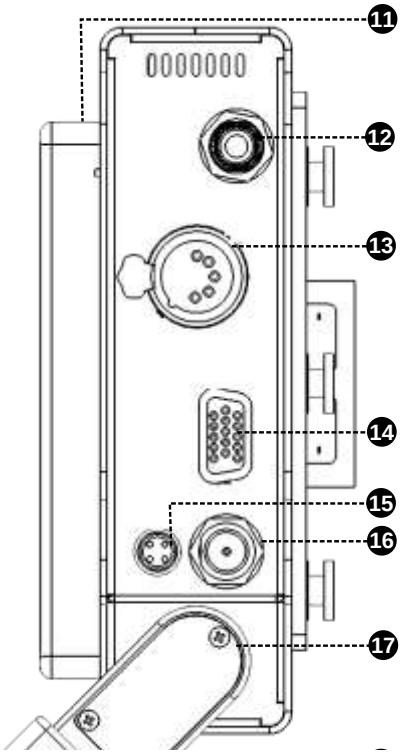


Figure 24 - Camera Unit Connectors

⓫ **Battery Mounting Plate**
Typically equipped for with Anton/Bauer or V-Mount batteries

⓬ **SD/SDI or HD/SDI Input - to Base** Station
Digital video input connector from camera's SDI output

⓭ **Intercom Headset Jack**
Connect 5-pin XLR Male intercom headset connector

⓮ **Connector for CHCR cable: Camera Remote Control, Tally**.
DB15HD connector for Camera Remote Control, Tally input and output. See Appendix. D.1. for the correct cable for your camera.

⓯ **PowerWafer Connector**
For use with PowerWafer when used with the AC-powered Base Station or the MPS power supply. Connect with CH3CP-INF-2FAG cable.

⓰ **VBS (analog composite video) or Genlock Out - from Base Station**
Connect to camera's Genlock/Sync input connector or to external VBS monitor

⓱ **Fiber Connector Swivel**
Attach fiber cable to connector mounted here.

3.1.2.2. Camera Unit - Fiber Connector/Swivel (Section B)

The CopperHead Pro Camera Unit is typically equipped with one of the three fiber connectors shown below

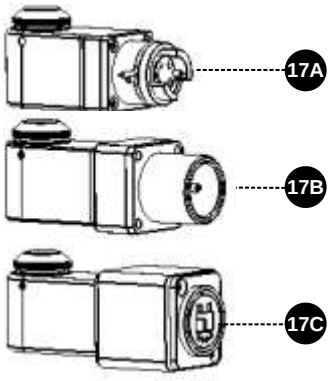


Figure 25 - Camera Unit Fiber Connectors

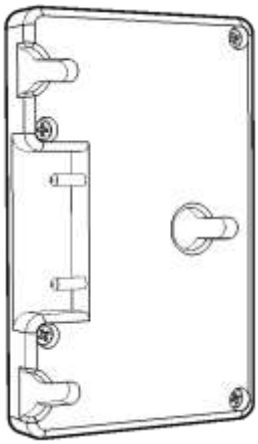
⓱A **MX Expanded Beam (unpowered)**

⓱B **SMPTE 304M (powered)**

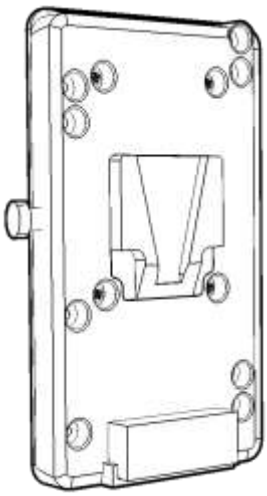
⓱C **OpticalCON (powered or unpowered)**

3.1.2.3. Camera Unit - Battery Mount (Section C)

The CopperHead Pro Camera Unit can be shipped with a variety of plates to attach the unit to your camera. The Anton Bauer mount and the “V”-mount are the most common. PAG and other battery mount systems are available by special order. Please contact Telecast Fiber Systems or your authorized dealer.



Anton Bauer Battery Mounting Plate



V-Mount Battery Mounting Plate

Figure 26 - Camera Unit - Battery side mounting plates

3.2. Base Station

The CopperHead Pro Base Station is available with a number of options. The unit is ordered with a specified Power Module, Audio/Intercom Module and Fiber Connector. For an overall view of component location please see the overall diagrams in Appendix G.

3.2.1. Base Station Front Panel

Figure 27 - Base Station Front Panel – single unit, 120/220 VAC power w/internal hybrid power supply

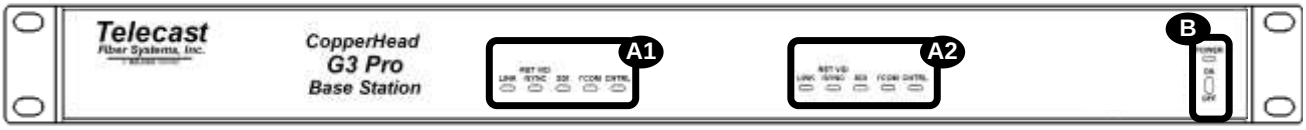


Figure 28 - Base Station Front Panel - dual unit, 12 VDC power

The front of Base Station has four areas of interest:

Ⓐ Signal Status Indicators
If Dual Base Station, A1 and A2.
Otherwise, A2 only.
See Section 3.2.1.1.

Ⓑ Power Switch and Indicator
See Section 3.2.1.2.

Ⓒ Hybrid Power Status Indicators
See Section 3.2.1.3.
Note: these indicators only appears on Base Stations equipped with internal hybrid power supply

3.2.1.1. Front Panel Section A – Signal Status Indicators

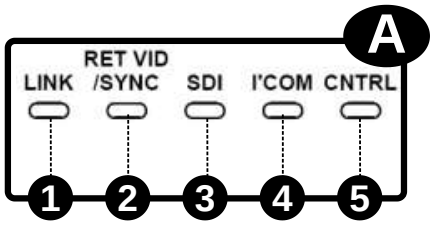


Figure 29 - Base Station Status Indicators

❶ **Link**
Indicates the status of the data link from Camera Unit to Base Station. This is a good indicator of adequate optical link.
GREEN when Base Station has a data "lock" with Camera Unit.
RED when Base Station is not "locked" to Camera Unit.

❷ **Return Video/Sync**
Indicates the presence of the analog video signal (VBS) at Base Station's "VBS In" BNC. This VBS can be used for return "program" video or for genlock to the camera.

❸ **SDI Presence**
Illuminates **GREEN** to indicate the presence of digital SDI video from Camera Unit. This will stay illuminated **GREEN** as long as there is adequate optical power being received at Base Station. See Appendix B for more information.

❹ **Intercom**
Illuminates **GREEN** to indicate audio activity on the Intercom channel.

❺ **Control**
Illuminates **GREEN** when camera control data is being transmitted between Camera Unit and Base Station.

3.2.1.2. Front Panel Section B– Power Switch and Indicator

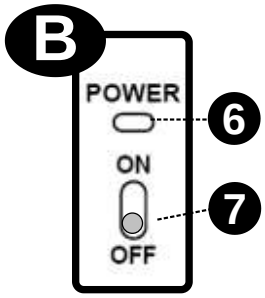


Figure 30 - Base Station Power Switch

❻ **Power**

Indicates that power is applied to Base Station.

GREEN when Base Station is fully powered.

RED when there is power connected to Base Station, but Base Station is not turned on.

❼ **Power Switch**

Used to turn Base Station on and off. With a hybrid power system (power supplied by Base Station) this switch will control power to the camera and Camera Unit.

3.2.1.3. Front Panel Section C– Hybrid Power Status Indicators

This section is optional, and only appears on CopperHead Pro Base Stations equipped with internal power supplies designed to work with a CopperHead Pro Camera Unit connected to a Telecast "PowerWafer"

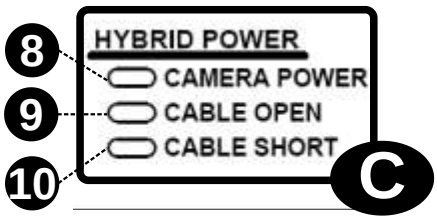


Figure 31 - Base Station Hybrid Power Status Indicators

❽ **Camera Power**

Illuminates **GREEN** when high voltage is being supplied to Camera Unit.

❾ **Cable Open**

Illuminates **RED** to indicate that the SMPTE hybrid cable is open or there is no SMPTE hybrid cable connected.

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

❿ **Cable Short**

Illuminates **RED** to indicate that the SMPTE hybrid cable has a short circuit in it.

High voltage will not be applied to the hybrid connector until the "short" condition is corrected or the cable is replaced.

3.2.2. Base Station Rear Panel

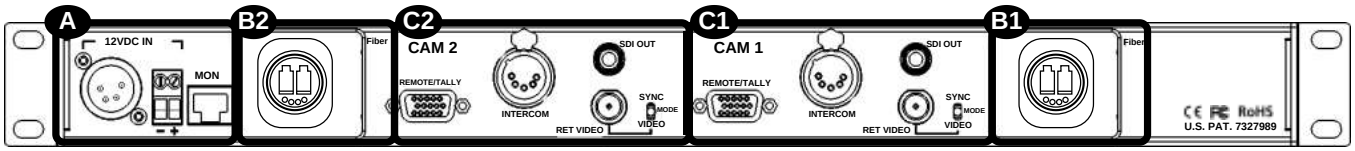


Figure 32 - CopperHead Pro Base Station Back Panel (Dual model shown)

Ⓐ Power Connector
See Section 3.2.1.1.

Ⓓ Fiber Connector(s)
See Section 3.2.1.2.

Ⓔ Signal Connectors
See Section 3.2.1.3.

3.2.2.1. Rear Panel Section A - Power Connector

The CopperHead Pro Base Station can be configured for DC or AC power.

3.2.2.1.a. 12VDC Power Interface

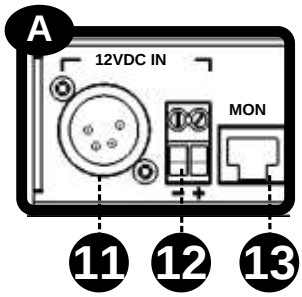


Figure 33 - 12VDC Power Connector

12Volt Power Connector Interface

This power interface is used on CopperHead Pro Base Stations that are not equipped with internal power supplies. This type of Base Station is typically used with Camera Units powered locally with a battery or a local power supply at the camera.

⓫ **12V DC Power input connector (XLR 4 Pin).**
⓬ **12V DC Input – terminal block**
This can be used in lieu of the 4-pin XLR or in parallel as a redundant input. See Appendix. C.2. for pin-out details
⓭ **For Future Use (RJ45)**

3.2.2.1.b. AC Mains Power Interface

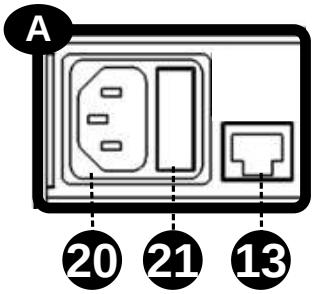


Figure 34 - AC Mains Connector

AC Power Connector Interface

This power interface is used on CopperHead Pro Base Stations that are equipped with an internal power supply. This type of Base Station is typically used with Camera Units powered with a PowerWafer via SMPTE Hybrid cable

⓴ **AC Power Receptacle** 100-240V 50/60 Hz
㉑ **3.15 amp dual fuse assembly.**
See Appendix. C.2. for fuse specification
⓭ **For Future Use (RJ45)**

3.2.2.2. Rear Panel Section B – Optical Connector

The fiber optic connector is used to connect Base Station directly to Camera Unit or to the external MPS or HDX power supply configured with your system. The type of fiber connector will vary depending on your system configuration. Six types of fiber optic connectors are available for use with the CopperHead Pro Base Station.

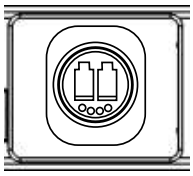
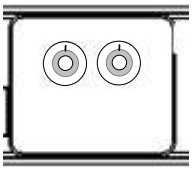
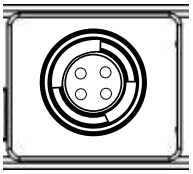
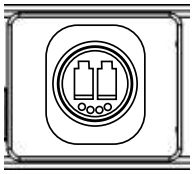
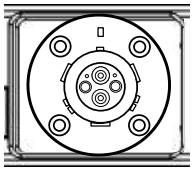
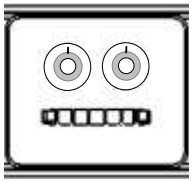
"Dry" (unpowered) fiber connectors			Fiber Connectors with Copper for Power		
					
A: OpticalCON (dry)	**B: STs**	**C. MX**	**D: OpticalCON (powered)**	**E. SMPTE 304M**	**F. STs & Molex**

Figure 35 - Fiber Optic Connector options

3.2.2.3. Rear Panel Section C – Signal Connectors

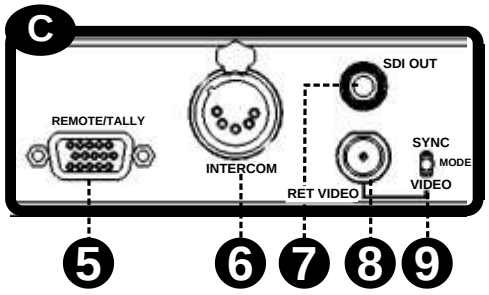


Figure 36 - Rear Panel Signal Connectors

❺ **Connector for Camera Remote Control Panel and Tally input (DB15HD)**

Connect CHBR-PRO cable here, specified for your particular Camera Remote Control Panel.

See Appendix. D.2. to specify the correct cable for your Camera Remote Control Panel

❻ **Base Station Intercom Connector**

Connect your house intercom system here:

XLR3: Two-wire (Clear-Com or RTS)

XLR5M: Four-wire (matrix-style)

For more information, refer to Section 5.2.1.

❼ **SD/SDI or HD/SDI Output**

Digital video from camera's SDI output

❽ **VBS Return Input**

Analog composite video signal sent to Camera Unit.

❾ **VBS Return Input Switch**

Switches the VBS Return Input connector to be optimized for one of two uses:

A) Sync In: Genlock/Sync/Tri-Level sync signal.

B) Composite Video In: Typically used to send analog VBS return video to the camera or an external monitor.

3.3. “PowerWafer” Camera Adaptor

The CopperHead Pro Camera Unit can be powered by the optional “PowerWafer” Camera Adaptor. The PowerWafer replaces the local camera battery and any local AC power supply adaptor. The PowerWafer gets its power from the use hybrid fiber cable and the CopperHead Pro Base Station equipped with the internal power supply or from the MPS external power supply.

Up to 95 watts of power can be delivered to the camera, Camera Unit and camera powered accessories. Up to 780 feet (240 meters) of cable can be used when Camera Unit is powered directly from Base Station.

The use of an external power supply can extend Base Station to Camera range and increase camera power flexibility. The MPS “Throw Down” device or Wafer Power Adaptor provides this functionality. This unit is described in Section MPS External PowerWafer Power Supply3.4.

The PowerWafer replaces the battery or local battery mountable AC adaptor (shown with the Anton/Bauer “Gold Mount” option).

❶ **Heat Sink**
❷ **Battery Mounting Plate (Anton/Bauer Gold Mont or “V-Mount”)**
❸ **Power Input Connector**

High voltage power is carried from Base Station to Camera Unit. A short jumper cable (CH3CP-INF-2FAG) carries the high voltage power from Camera Unit to the PowerWafer’s power input connector, where it is converted to 12VDC power. The 12VDC power is delivered back to the camera via the battery mounting plate.

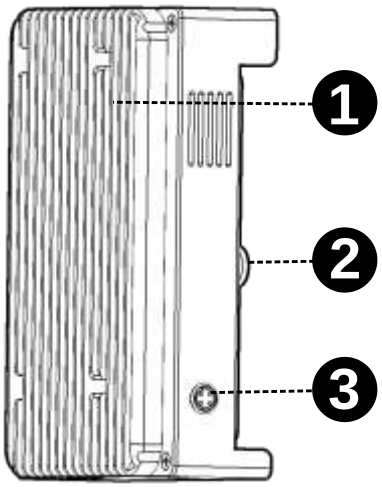


Figure 37 - PowerWafer Power Adaptor

Figure 38 - CH3CP-INF-2FAG Power Wafer Jumper Cable

3.4. MPS External PowerWafer Power Supply

The CopperHead MPS external power supply provides 95 watts of 12VDC power and fiber connectivity from Base Station to Camera Unit equipped with a CopperHead PowerWafer. Connectivity between the MPS unit to the camera can be configured using either a Hybrid OpticalCON connector or a SMPTE 304M connector. The nominal distance between them is 240 meters (780 feet).

Connectivity between the MPS unit and Base Station uses "dry" fiber and can be configured with a "dry" OpticalCON connector or two ST connectors. The MPS is powered locally with standard AC power. The unit is free standing. See Section 5.3.4. for system configuration with the MPS Power Supply and PowerWafer.

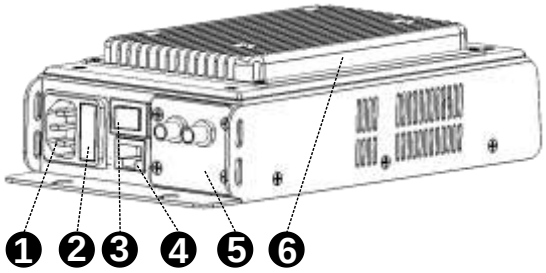


Figure 39 – MPS Power Supply

Figure 40 - MPS Power Supply - Rear

❶ **AC Power Receptacle: 100-240V 50/60 Hz**

❷ **Fuse compartment**
See Appendix C.2.a. for the fuse specification

❸ **Power Switch**

❹ **For Future Use (RJ45)**

❺ "**Dry" Fiber Optic Connection to CopperHead Base Station**
This removable plate can be equipped with two ST connectors or a "dry" OpticalCON connector. See Figure 41

❻ **Heat Sink**

❼ **Powered Fiber Optic Connection to CopperHead Camera Unit**
This removable plate can be equipped with a SMPTE 304M connector or a powered OpticalCON connector. See Figure 42.

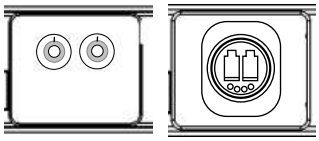


Figure 41 - MPS "dry" fiber connector options

The "dry" connection ❺ to the CopperHead Base Station can be equipped with two ST connectors or a "dry" OpticalCON connector.

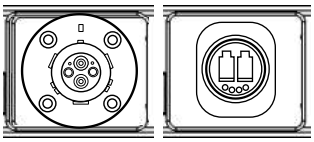


Figure 42 - MPS powered fiber connector options

The powered connection ❼ to the CopperHead Camera Unit can be equipped with a SMPTE 304M connector or a powered OpticalCON connector.

Part Number	"Dry" Unpowered Fiber Connection to Base Station (❺)	Powered Fiber Connection to Camera (❼)
CH2-MPS-95VD-2ST-NEU	2 STs	OpticalCON
CH2-MPS-95VD-2ST-304	2 STs	SMPTE 304M
CH2-MPS-95VD-NEU-NEU	OpticalCON	OpticalCON
CH2-MPS-95VD-NEU-304	OpticalCON	SMPTE 304

Table 2 - MPS Power Supply Adaptor Options

3.5. PowerPlus 3000 - Camera Power Adaptor

The standard CopperHead PowerPlus 3000 power adaptor with standard (Low Profile) heat sink (Figure 43) provides 100 watts of 12VDC power and fiber cable signal connectivity from Base Station to the Camera. It also provides an external power feed of 12VDC and optionally 24VDC for external accessories. The PowerPlus unit requires the use of the HDX power supply.

The PowerPlus can be equipped with a "High Profile" heat sink (Figure 44) for power requirements up to 150 Watts.

The PowerPlus unit is equipped with a fixed tactical fiber "dongle" that can be terminated with either an OpticalCON plug, SMPTE 304M plug or an MX plug. This dongle plugs into the swivel of the CopperHead Camera Unit.

The PowerPlus is connected to the HDX power supply using Hybrid fiber cable with SMPTE 304 connectors. See Section 4.3. for details on connecting the PowerPlus.

The distance between the HDX power adaptor and the camera can be up to 2KM (1.2 miles) using Hybrid fiber cable and the distance between the HDX power adaptor and Base Station can be up to 7KM (4.3 miles).

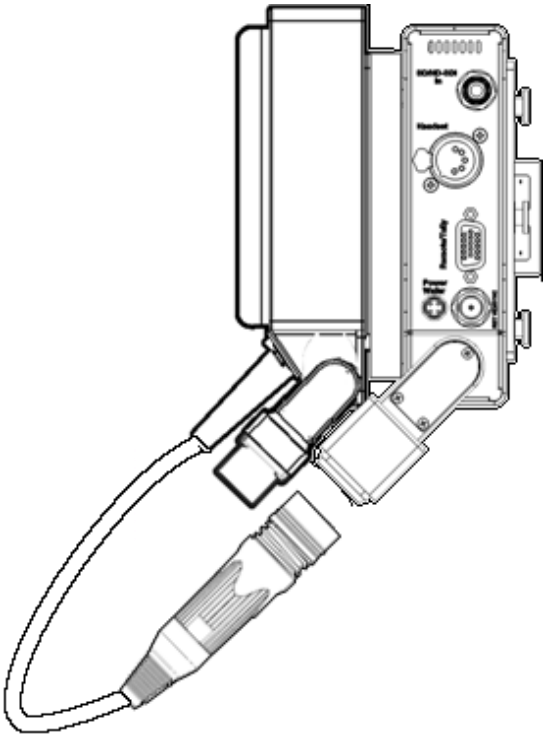


Figure 43 - PowerPlus 3000 with Low Profile Heat Sink mounted to CopperHead Pro

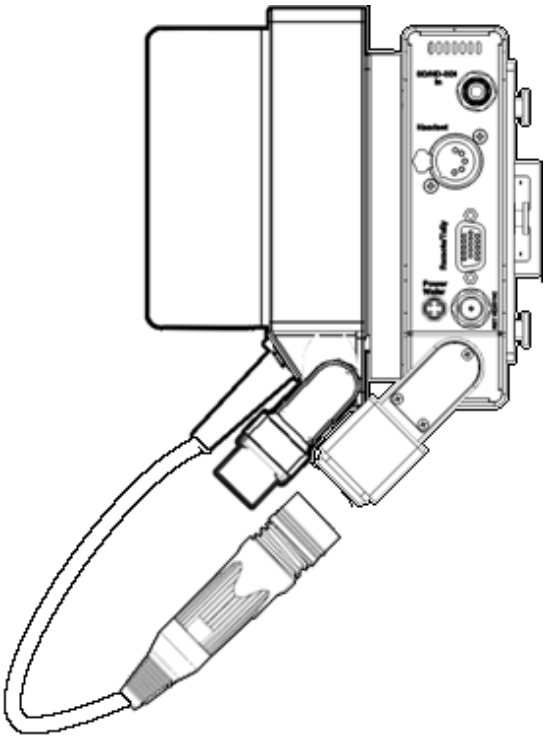


Figure 44 - PowerPlus 3000 with High Profile Heat Sink mounted to CopperHead Pro

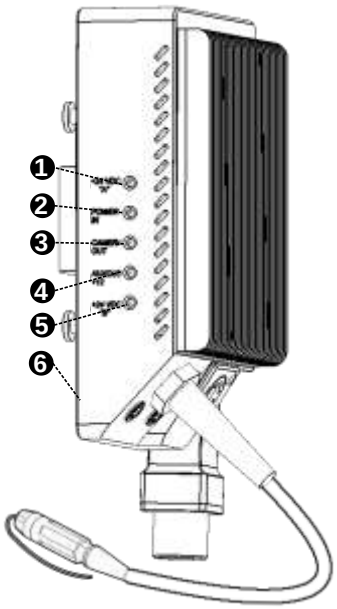


Figure 45 - PowerPlus 3000 LED Indicators

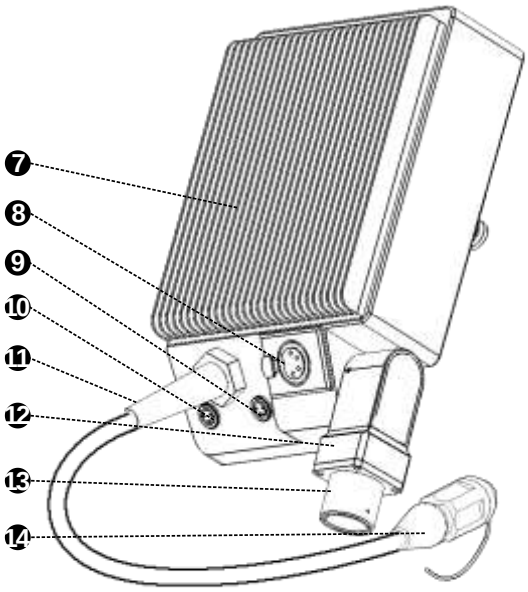


Figure 46 – PowerPlus 3000 Connectors

❶ **24 Volt DC "A"**
Illuminates when 24 Volts is available on connector ❾

❷ **Power In**
Indicates that power is being received from the HDX power supply
RED – initial safety handshaking in progress, full power not engaged.
GREEN – safety handshaking completed, full power being received from HDX power supply.

❸ **Camera Out**
Indicates that 12VDC is being supplied to the battery plate

❹ **Auxilliary +12 Volt Output**
Indicates 12 Volt is being supplied to the 4-pin XLR connector ❼

❺ **24 Volt DC "B"**
Illuminates when 24 Volts is available on connector ❿

❻ **Battery Plate**
Used to mount the PowerPlus to the CopperHead Camera Unit (Anton/Bauer or V-Mount)

❼ **Heat Sink**
LP- Low Profile Heat Sink rated for 100 Watts (shown)
HP – High Profile Heat Sink rated for 150 Watts

❽ **12 Volt Auxiliary Output**
4-Pin XLR output connector for 12 Volt accessories

❾ **24 Volt Auxiliary Output B**
3-pin connector for 24 Volt accessories.

❿ **24 Volt Auxiliary Output A**
3-pin connector for 24 Volt accessories.

⓫ **Tactical Fiber Dongle**
Fixed tactical fiber cable connects to the CopperHead Camera Unit.

⓬ **SMPTE Swivel**
Adjustable swivel for SMPTE 304M receptacle ⓭.

⓭ **SMPTE 304M Hybrid Fiber Receptacle**
Connect the SMPTE hybrid cable here. This cable connects to the PowerPlus.

⓮ **Tactical Fiber Connector (MX shown)**
Dry fiber connector at the end of the dongle. This should match the connector on the swivel of the mating CopperHead Camera Unit. Available with the following termination:

- MX plug (shown)
- OpticalCON Connector ("dry")
- SMPTE 304M plug ("dry").

3.6. HDX Power Supply

The HDX Power Supply Unit is required when using the PowerPlus Camera Adaptor. The HDX can be used as a free-standing unit or rack mounted, using the HDX-FR-2 for mounting two HDX units.

The unit sends power via a SMPTE hybrid fiber cable to the PowerPlus, where it is converted to 12VDC and optionally to 24VDC). See Section 2.2.3. for details on connecting the HDX to a CopperHead system.

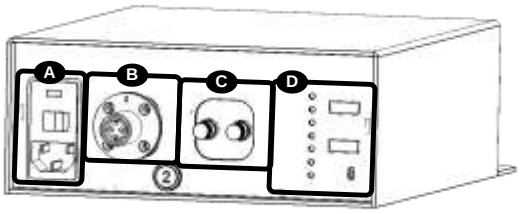


Figure 47 - HDX Front Panel

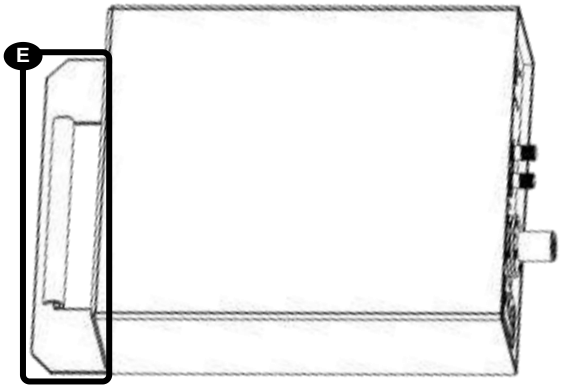


Figure 48 – Stand-alone HDX w/handle

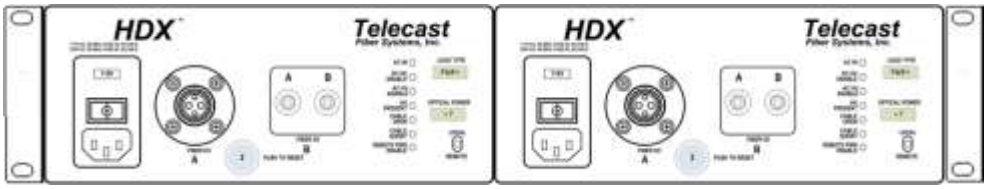


Figure 49 – HDX-FR-2 Two Unit HDX Rack Mount

The HDX has five areas of interest:

Ⓐ AC Power Input Module and Switch

Power Switch and connector for AC Mains.

Ⓑ "Wet" SMPTE 304M Hybrid Fiber Connector

The SMPTE hybrid cable is connected here. This cable connects to the PowerPlus at the camera. This mating connector pair always uses SMPTE 304M connectors.

Ⓒ "Dry" Fiber connector(s).

The CopperHead Base Station is connected here. This interface can be equipped with a variety of fiber connectors:

- Two ST connectors
- MX connector
- OpticalCON connector

Ⓓ Status Indicators

These indicators show the status of the HDX's power system. See Section 3.6.1. for more details.

Ⓔ HDX Integrated Handle

Stand-alone unit can be carried or hung from this robust handle

3.6.1. HDX Status Indicators

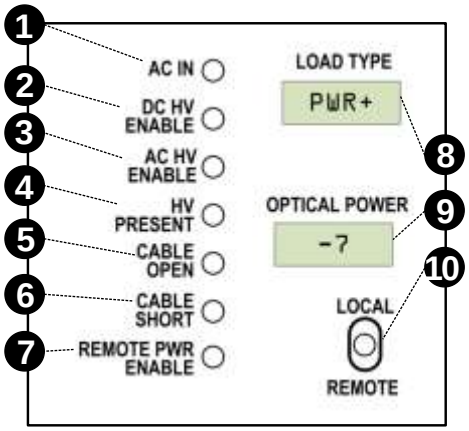


Figure 50 - HDX Displays

1. **AC IN - MAINS**
   AC Input power is present
2. **DC HV ENABLE**
   DC "Sense" voltage from PowerPlus is present
3. **AC HV ENABLE**
   AC "Sense" voltage from PowerPlus is present
4. **HV Present**
   AC or DC voltage is available on Hybrid connector
5. **DC HV ENABLE**
   DC "Sense" voltage from PowerPlus is present
6. **AC HV ENABLE** AC "Sense" voltage from PowerPlus is present
7. **HV Present**
   AC or DC voltage is available on Hybrid connector
8. **LOAD TYPE**
   Indicates the type of load or camera being used:
   N/A – No load detected
   PWR+ - PowerPlus detected
9. **Optical Power**
   Not used with PowerPlus.
10. **Local Remote**
    Not Used With PowerPlus.

Chapter 4 – Camera Unit and Power Supply Installation

When mounting the CopperHead Pro Camera Unit, always position the camera so that the battery mounting plate at the rear of the camera is easy to access. Insure that the camera is well supported and stable. If a battery is mounted remove it and put it to one side. The camera model shown here is for illustrative purposes only – your camera may differ.

Installing the CopperHead Camera Unit typically involves one of the following three configurations.

4.1. Mounting the Copperhead Pro Camera Unit with a battery
4.2. Mounting the Copperhead Pro Camera Unit with the PowerWafer
4.3. Mounting the Copperhead Pro Camera Unit with the PowerPlus

4.1. Mounting the Copperhead Pro Camera Unit with a battery

When the camera is powered locally at the camera position, either by a battery (as shown) or by a local power source, tactical fiber is typically the preferred connection to Base Station.

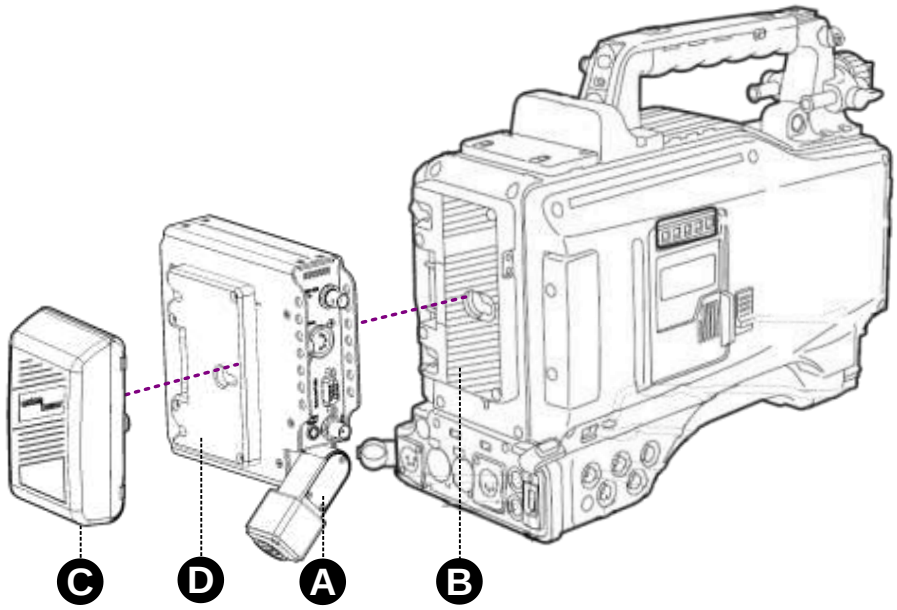


Figure 51 - Mounting the Copperhead Pro Camera Unit to the Camera

1) Attach the CopperHead Pro Camera Unit Ⓐ to the camera battery mounting plate Ⓑ. The mounting is mechanically identical to attaching a battery.
2) Mount the battery Ⓒ to the CopperHead Pro Camera Unit battery mounting plate Ⓓ exactly as you would mount the battery to the camera.
3) Instructions for attaching the required cables between the camera and Camera Unit can be found in Section 5.1. .

4.2. Mounting the Copperhead Pro Camera Unit with the PowerWafer

The PowerWafer allows the camera and Camera Unit to be powered via hybrid fiber cable, which is powered from the CopperHead Pro Base Station or MPS External Power Supply.

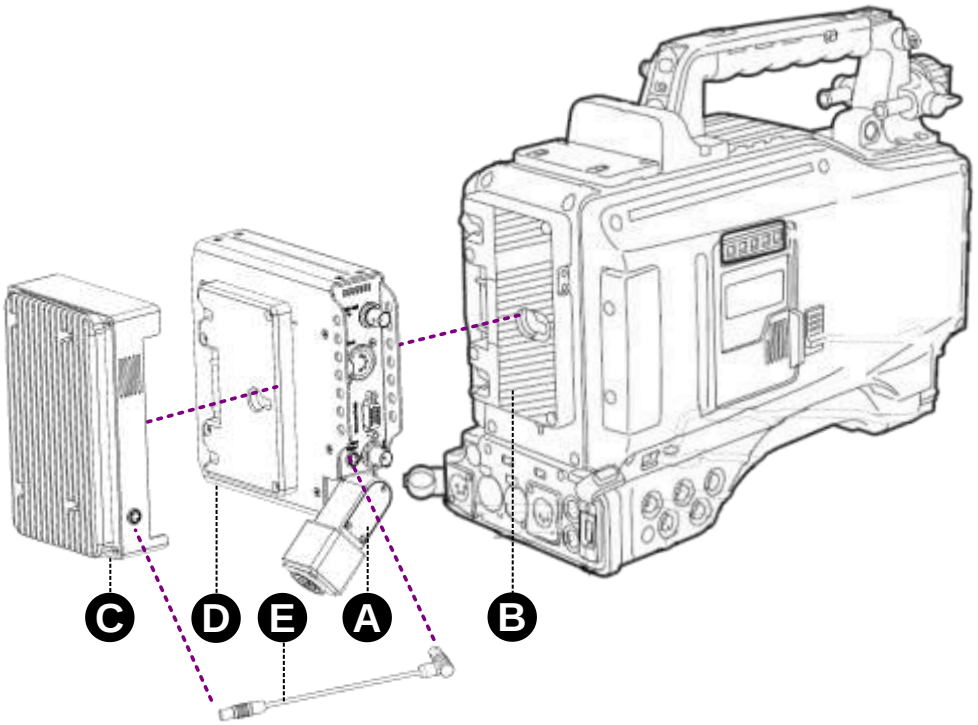


Figure 52 - Mounting the PowerWafer Unit to the Copperhead Pro Camera Unit

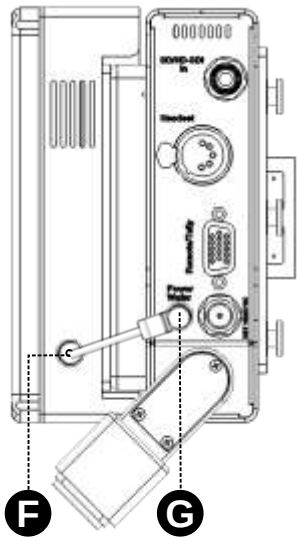


Figure 53 – Attaching the PowerWafer Cable

1) Attach the CopperHead Pro Camera Unit Ⓐ to the camera battery mounting plate Ⓑ. The mounting is mechanically identical to attaching a battery. Instructions for attaching the required cables between the camera and the Pro Camera Unit can be found in Section 5.1. .
2) Mount the PowerWafer Ⓒ to the CopperHead Pro Camera Unit battery mounting plate Ⓓ exactly as you would mount the battery to the camera.
3) Connect the supplied PowerWafer connector cable Ⓔ. (model CH3CP-INF-FAG2) between the PowerWafer Ⓒ and the PowerWafer connector on Camera Unit Ⓐ.
4) For best results, plug the straight connector Ⓕ into the PowerWafer and the connector with the Right Angle Ⓖ into the Copperhead Camera Unit.

4.3. Mounting the Copperhead Pro Camera Unit with the PowerPlus

The PowerPlus allows the camera and Camera Unit to be powered via hybrid fiber cable for extra-long distances at higher power than the PowerWafer. The PowerPlus is powered via the hybrid fiber cable from the HDX Power Supply.

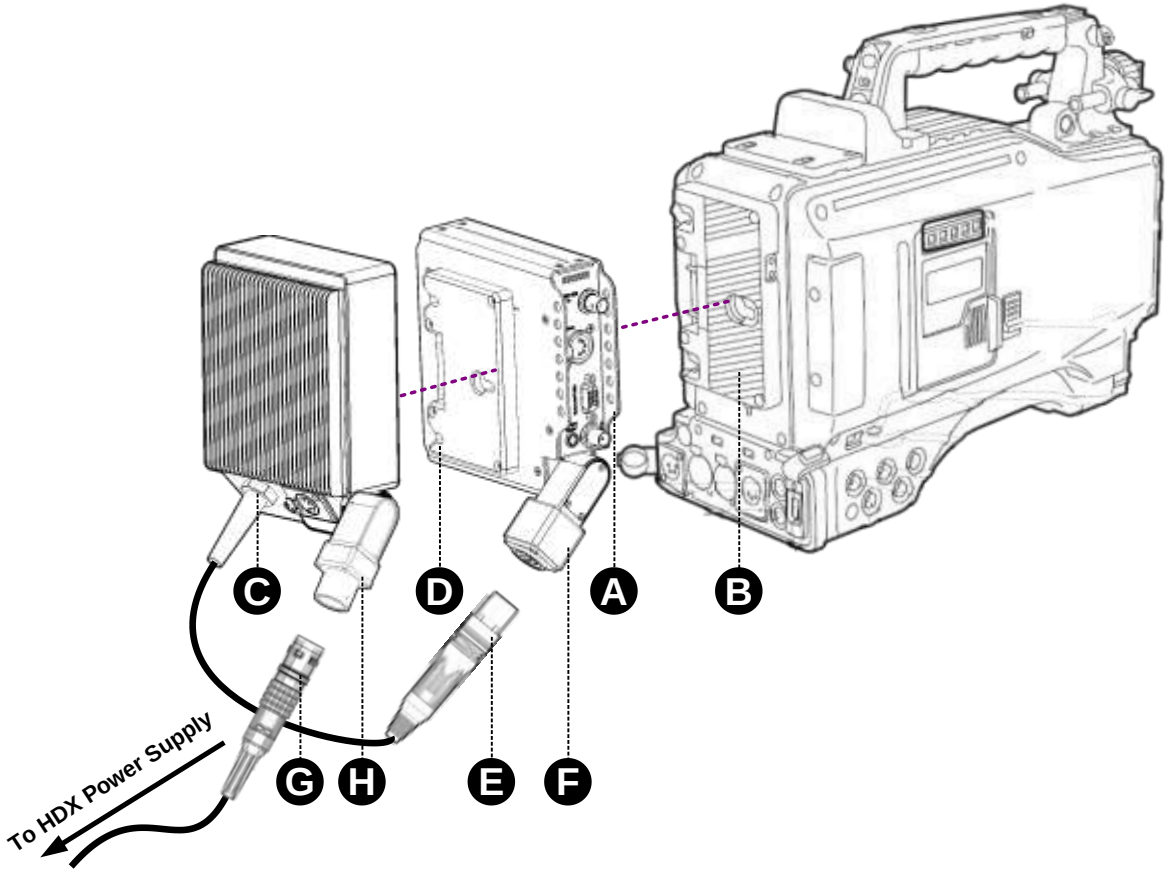


Figure 54 - Mounting the PowerPlus Unit to the Copperhead Pro Camera Unit

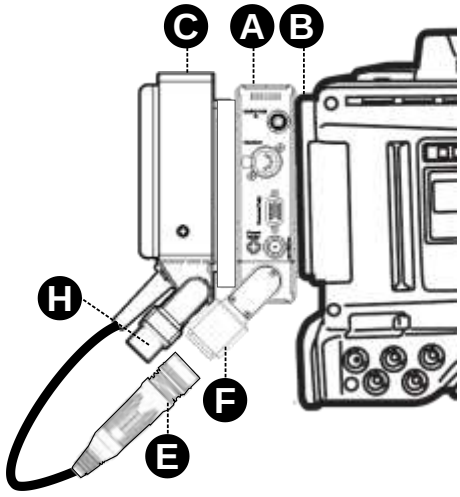


Figure 55 - PowerPlus on CopperHead Pro

1) Attach the CopperHead Pro Camera Unit Ⓐ to the camera's battery mounting plate Ⓑ. The mounting is mechanically identical to attaching a battery to the camera.
2) Mount the PowerPlus Ⓒ to the CopperHead Pro Camera Unit battery mounting plate Ⓓ exactly as you would mount a battery to the camera.
3) Connect the PowerPlus "dongle" Ⓔ to the fiber optic swivel Ⓕ on Camera Unit Ⓐ. Connect the SMPTE hybrid cable connector Ⓖ from the HDX to the SMPTE receptacle Ⓗ on the PowerPlus.

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Chapter 5 – Connecting the CopperHead Pro System

The CopperHead Pro system is designed to integrate seamlessly into virtually any production environment. Prior to connecting your system please insure that each of the required cables and accessories is available.

5.1. Connecting Camera Unit to a Camera or Camcorder

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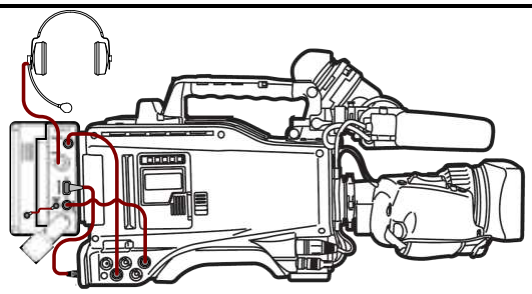


Figure 56 - Camera with CopperHead Pro and cables

Connecting the CopperHead Camera Unit requires the following:

- Two short BNC-terminated coax cables
- CHCS-Pro cable
- Headset
- External Tally light (optional)
- Fiber cable to Base Station

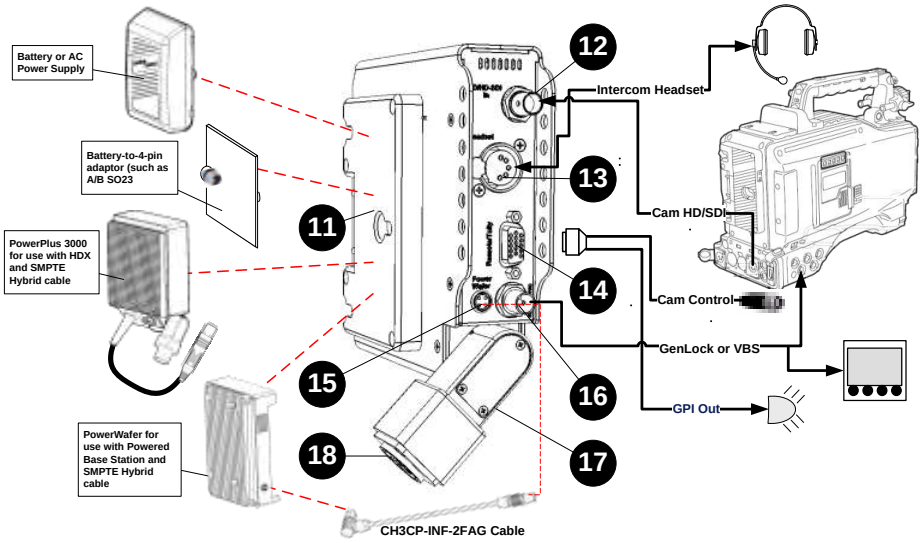


Figure 57 - Camera Unit to Camera Connections

⓬ **HD/SDI Input** - Connects to the camera's HD/SDI or SD/SDI output signal

⓭ **Headset** - Receptacle for intercom headset.

⓮ **Remote/Tally** - Connect to CHCR-PRO cable. This cable connects to the "Remote" connector of the camera, as well as to an external Tally light (customer supplied). See Appendix. D.1. for details.

⓯ **PowerWafer** - Connect to the PowerWafer using cable CH3CP-INF-2FAG. Powered Base Station or MPS Power Supply required. See Appendix C.2.a. .

⓰ **VBS Out** - Two options:
Genlock: connect to the genlock input of your camera,
Return Video: connect to an external analog VBS monitor

⓱ ⓲ **Fiber** - Swivel with fiber connector: MX, OpticalCON or SMPTE 304M

5.2. Connecting Base Station to Studio Infrastructure

Connecting the CopperHead Base Station requires the following:

- Two BNC-terminated coax cables to connect to your infrastructure
- CHBR-Pro cable
- Camera Remote Panel
- XLR cable to connect to your intercom system (see Section 5.2.1.)
- Access to your video switcher's tally outputs (optional)
- Fiber cable to Camera Unit

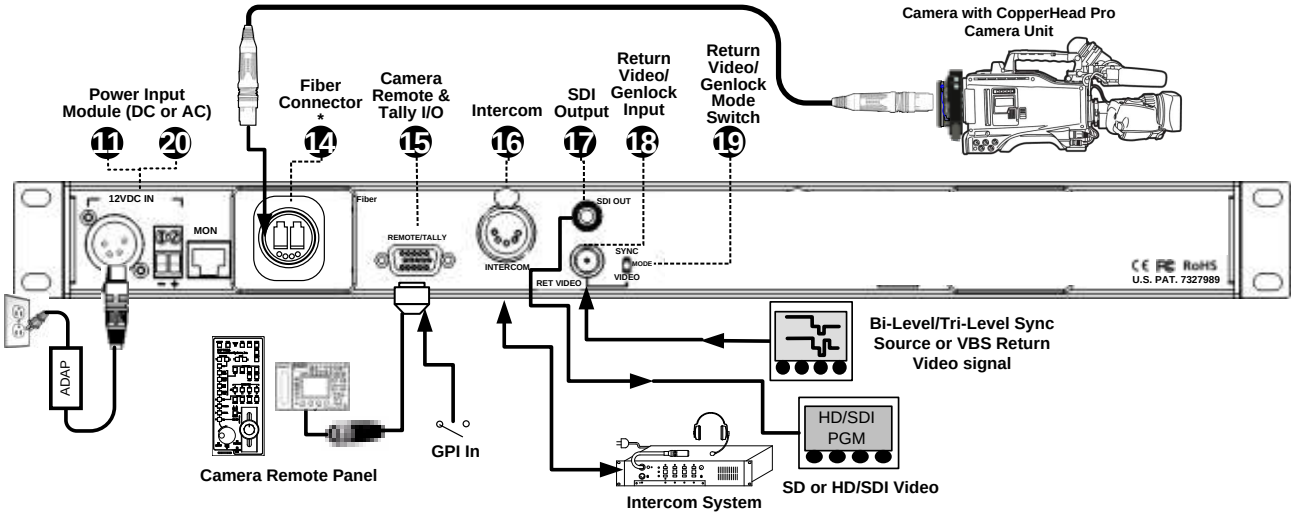


Figure 58 - CopperHead Pro Base Unit Connections

11 **12 VDC Input** – Connect to 12VDC power supply

20 **120/220 VAC Input** - Connect to AC mains

14 **Fiber** – Connect fiber cable to CopperHead Camera Unit

15 **Remote/Tally** - Connect to CHBS-PRO cable. This breakout cable connects to a Camera Remote Control Panel. The pigtail connects to the tally output of a switcher or to a studio Tally system. See Appendix. D.2. for details.

16 **Intercom** - The house intercom system is connected here. See Section 5.2.1. for details

17 **SDI Out** - The digital video output (HD/SDI-SDI) from your camera is found here

18 **Return Video In** - House genlock/sync or return VBS analog video is connected to this BNC

19 **Return Video Mode Switch** - Switch to optimize the return video path (18) for Genlock/Sync or analog return VBS video

5.2.1. Intercom connectivity

The CopperHead Pro Base Station is delivered pre-configured for compatibility with either “Two-Wire” or “Four-Wire” intercom systems, which can be identified by the XLR connector:

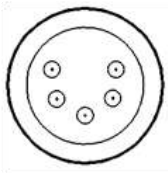
Intercom	**Two Wire**		**Four Wire**
	RTS	Clear-Com	Universal/Matrix
	(switchable: see below)		
Connector	XLR3 Female		XLR5 Male
			
Pin-outs	Appendix C.2.h.	Appendix C.2.g.	Appendix C.2.f.

Table 3 - Intercom Interface

Two-Wire Interface - RTS or Clear-Com (switchable): Connect the CopperHead Pro Base Station to a two-wire intercom system like any other intercom component (such as a belt pack or station). Internal dip switches (as shown in Figure 59 **– Two-Wire Intercom Configuration Dip Switches**) are used to set the two-wire intercom configuration (see Table 4). The system is delivered from the factory configured as requested by the end-user or dealer. An adhesive label on the rear of the unit indentifies the factory setting (C-C, RTS1, RTS2, 4W)**.**

Four-Wire Interface: This is used to connect Base Station to four-wire intercom systems such as matrix-style systems.

Two-Wire Intercom Configuration			
		SW1	
Mode	**Intercom System**	**A**	**B**
1	No Comms	Off (0)	Off (0)
2	RTS CH 1	Off (0)	On (1)
3	RTS CH 2	On (1)	Off (0)
4	Clear-Com		
5	Not Used	On (1)	On (1)

Table 4 - Intercom Configuration Switches

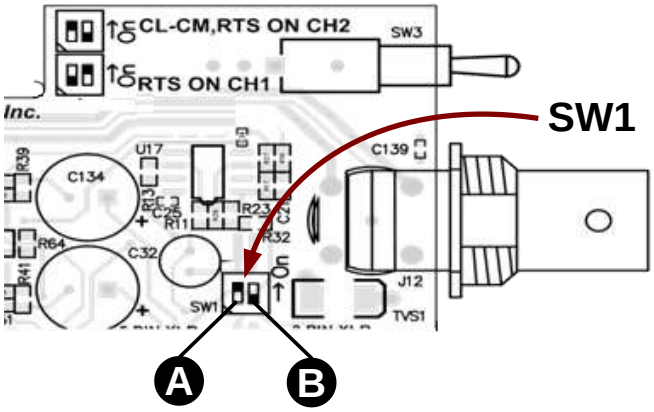


Figure 59 – Two-Wire Intercom Configuration Dip Switches

5.3. Fiber Connections between the Copperhead Pro Base Station and Camera Unit

The following table summarizes the various fiber cable connection options between the Copperhead Pro Base Station and Camera Unit.

Cable Type	Base Station Power	Camera Unit Power	Distance Range Between Camera and Base
Tactical Fiber	12VDC	Local Battery or AC Power	Up to 10 KM
SMPTE Hybrid Fiber	120/220VAC with Internal Camera Power Supply	PowerWafer Adaptor	240 meters
SMPTE Hybrid Fiber	External MPS Power Supply 95 Watts[1]	PowerWafer Adaptor	5 KM between base and power supply 240 meters between power supply and camera
SMPTE Hybrid Fiber	External HDX Power Supply – 150 Watts[2]	PowerPlus Adaptor	5 KM between base and power supply 3.2 KM between power supply and camera

Table 5 - CopperHead Pro Power Options

1. The external MPS power supply must be equipped with the required fiber cable connectors depending on your system requirements. See Section 3.4. for a description of the various options
2. The external HDX Power Supply provides two ST Fiber Connectors for connection between the HDX and Base Station and a SMPTE 304M Connector for connection between the HDX and Camera Unit.

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.

5.3.1. Tactical Fiber between Base Station and Camera Unit

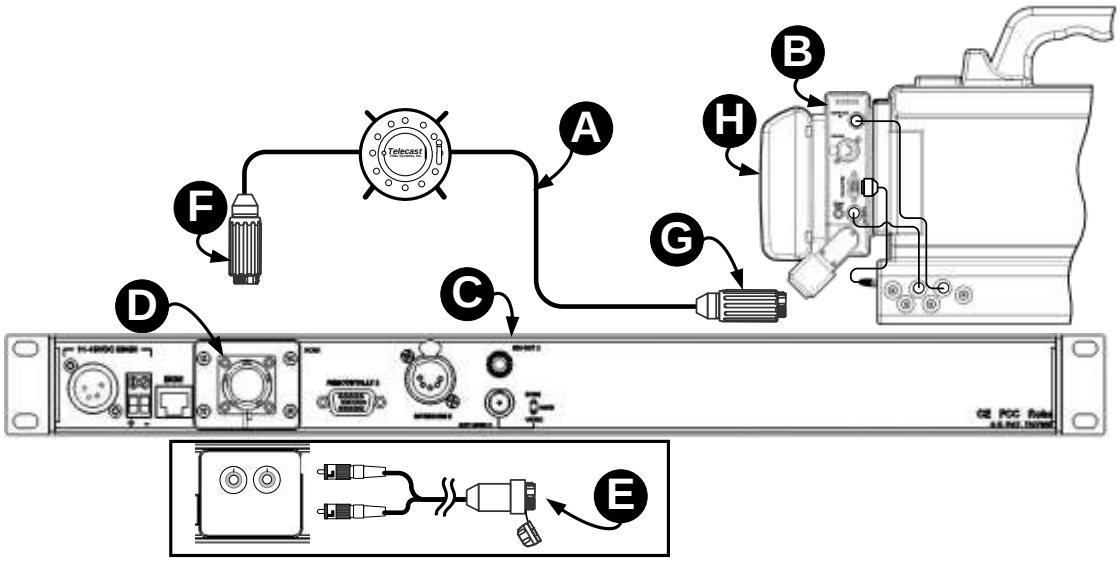


Figure 60 - Tactical Fiber between Base Station and Camera Unit

Connect a tactical fiber cable Ⓐ **b**etween Camera Unit Ⓑ Base Station Ⓒ.

Base Station fiber receptacle may be mounted either on the back of Base Station Ⓓ, or on a panel mounted elsewhere Ⓔ. At each end of the fiber cable will be either an OpticalCON or MX Fiber Connector Ⓕ and Ⓖ**.**

The camera must be powered by local power, such as a battery or a local AC power supply Ⓗ**.**

5.3.2. SMPTE Hybrid Fiber between Base Station (powered) and Camera Unit

Camera Powered through Hybrid Cable from Base Station

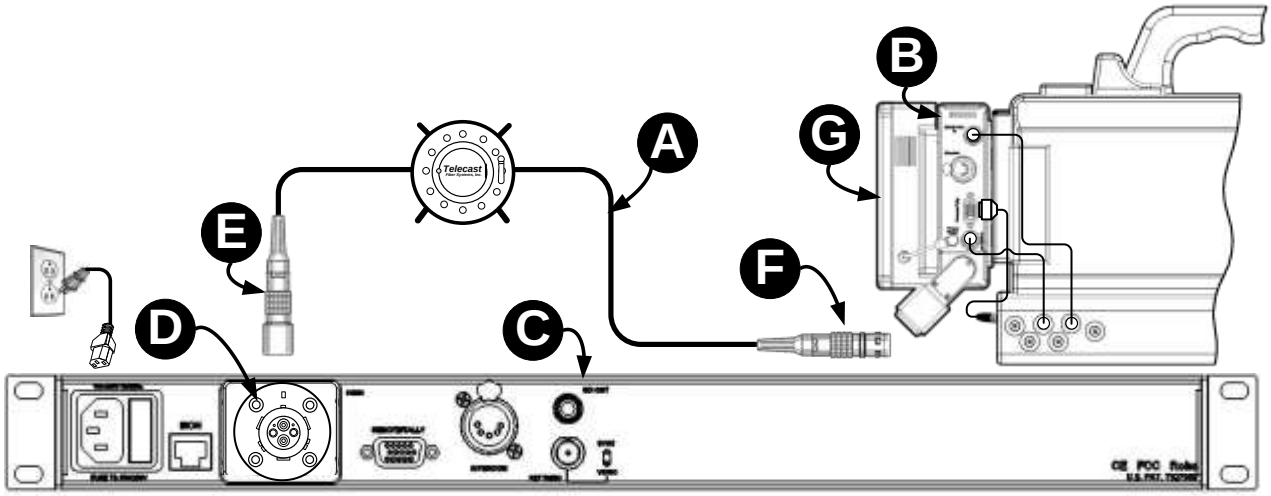


Figure 61 - SMPTE Hybrid Fiber between Base Station (powered) and Camera Unit

Connect a length of SMPTE Hybrid fiber cable Ⓐ between Camera Unit Ⓑ and the fiber receptacle Ⓒ on the back of Base Station Ⓓ.
At each end of the fiber cable will be either an OpticalCON or SMPTE 304M Hybrid fiber connector Ⓔ and Ⓕ.
The camera will be powered by the CopperHead PowerWafer Camera Power Supply Ⓖ.

5.3.3. Hybrid Fiber between Base Station and Camera Unit (Infrastructure Wiring)

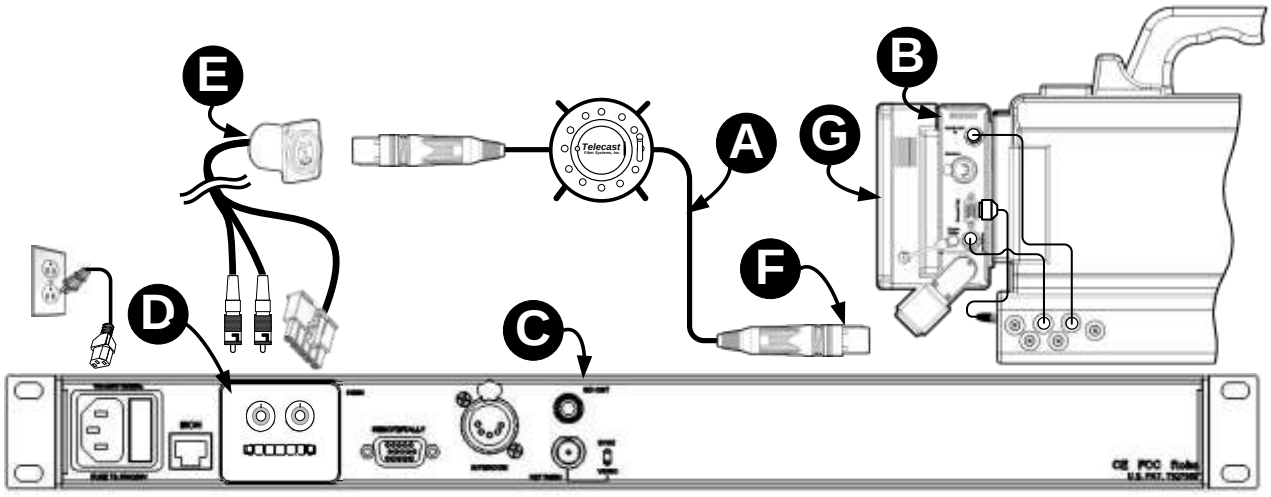


Figure 62 - Hybrid Fiber between Base Station and Camera Unit (Infrastructure Wiring)

A remotely-mounted fiber connector can be used for permanent installations such as communications closets, truck connector panels and within/between buildings. A panel Ⓓ with two STs (fiber) and a Molex connector (power) is mounted on Base Station Ⓒ.

Infrastructure fiber and copper wiring from Base Station connect to a remote panel-mounted OpticalCON or SMPTE 304M receptacle Ⓔ. A standard hybrid fiber optic cable Ⓐ connects the panel- mounted receptacle and Camera Unit Ⓑ, equipped with a PowerWafer Ⓖ.

5.3.4. Hybrid Fiber Cable between MPS Power Unit and Camera Unit

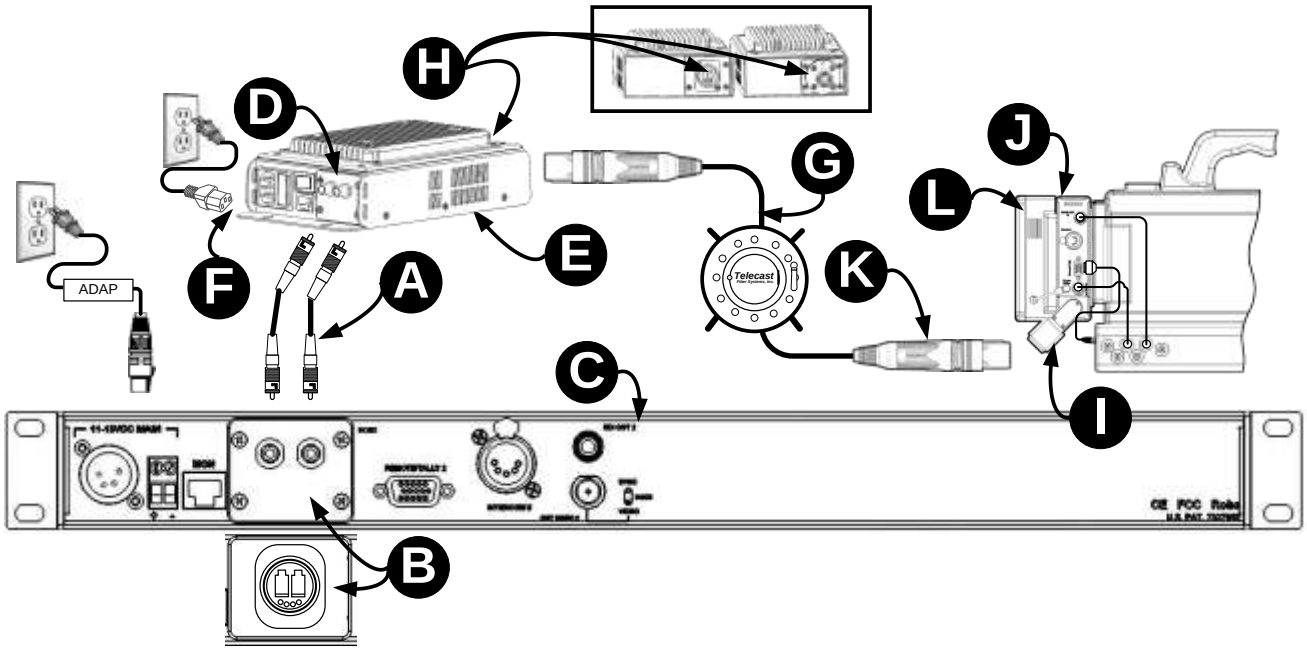


Figure 63 - Hybrid Fiber cable between the MPS Power Supply and Camera Unit

Dry fiber can be used between Base Station and the MPS External Power Unit, and the camera can be powered by the MPS over powered hybrid fiber.

Connect "dry" (unpowered) single mode fiber cable Ⓐ between the fiber connector(s) Ⓑ on Base Station Ⓒ and the "dry" fiber connector(s) Ⓓ on the MPS Power Supply Ⓔ. Connect the MPS Power Supply Ⓔ to AC Mains Ⓕ. Connect a length of hybrid fiber cable Ⓖ between the powered connector Ⓗ on the MPS Power Supply Ⓔ and the swiveled fiber connector Ⓘ on Camera Unit Ⓙ. The hybrid fiber cable can be equipped with either OpticalCON or SMPTE 304M connectors Ⓚ. The camera and Camera Unit will be powered via the hybrid cable by the PowerWafer Ⓛ.

The "dry" fiber connectors Ⓓ on the MPS Power Supply Ⓔ and the "dry" fiber connector(s) Ⓑ on Base Station Ⓒ can equipped with one of two connector options:

- Two ST connectors (shown)
- OpticalCON connector

The powered fiber connectors Ⓗ on the MPS Power Supply Ⓔ and the fiber connector Ⓘ on Camera Unit Ⓙ be equipped with one of two connector options:

- Two ST connectors (shown)
- OpticalCON connector

Other fiber optic connectors are available by special order. Contact Telecast Fiber Systems or your CopperHead dealer for more information.

5.3.5. SMPTE Hybrid Fiber between HDX Power Supply and Camera Unit

ST Fiber Connectors between Base Station and HDX Power Unit, camera powered by Copperhead PowerPlus

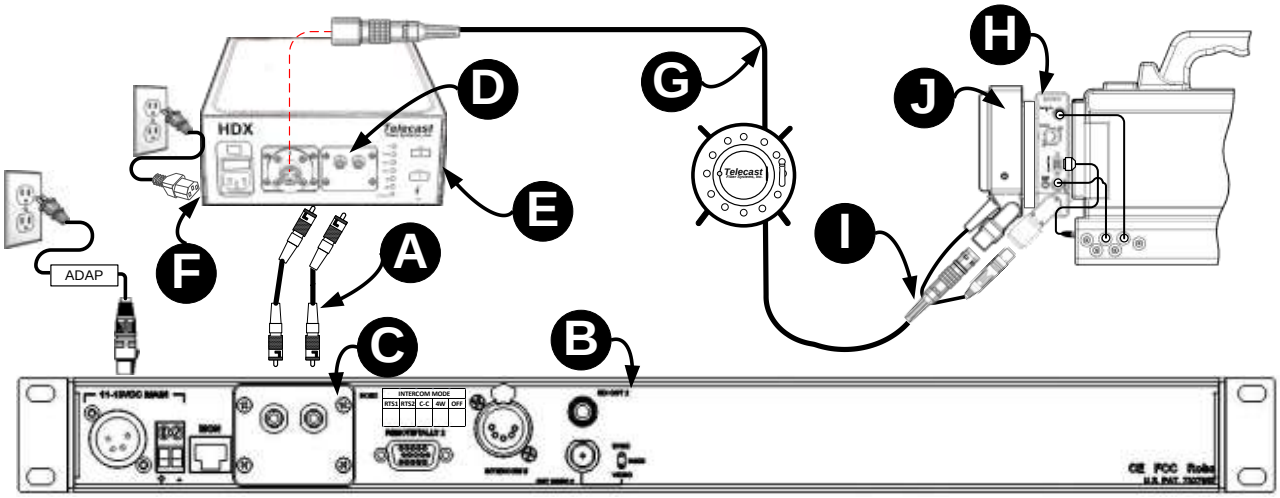


Figure 64 - SMPTE Hybrid Fiber between the HDX Power Supply and Camera Unit

Mount the PowerPlus ❶ to the CopperHead Camera Unit ❿ as shown in Section 4.3. , being sure to plug the PowerPlus' tactical fiber "dongle" ❽ into the swivel-mounted fiber connector on Camera Unit ❽.

Connect dry (unpowered) fiber cable ❶ between the fiber connector(s) ❸ on Base Station ❷ and the "dry" fiber connector(s) ❹ on the HDX Power Supply ❺. Connect the HDX Power Supply ❺ to AC Mains ❻. Connect a length of hybrid fiber cable ❼ between the HDX Power Supply ❺ and the swivel-mounted SMPTE 304M connector ❽ on the PowerPlus ❶. The hybrid fiber cable can be equipped with either OpticalCON or SMPTE 304M connectors ❾. The camera and Camera Unit will be powered via the hybrid cable by the PowerPlus ❶.

Note: Connectors at each end of the fiber cable must be SMPTE 304M I. OpticalCON connectors cannot be used in this configuration.

5.4. Deployment of the CopperHead Pro System

The CopperHead Pro system is available with many different variations, including different battery mounting plates, powering options, fiber cable connectors and intercom system interfaces. This allows for many permutations that are all slightly different. Hence, not every possible operational environment can be described. However, the following steps are recommended:

1. Set up and test your Copperhead Pro system immediately to confirm proper operation and to provide training to you and your team prior to an actual production.
2. Do not attempt to power up the system until the fiber optic cable has been connected at both ends.
3. Install Camera Unit and battery or power supply as shown in Chapter 4.
4. Connect all Camera Unit and Base Station cables as shown in Chapter 5. The order in which you connect the cables makes no difference. However, to prevent damage other sensitive electronics (such as camcorders and Remote Control Panels):
    a. Make sure to connect the CHCR Camera Remote Control cable to the camera when the camera is powered off.
    b. Make sure to connect the CHBR Base Remote Cable to the remote control panel when Base Station power is turned off.
5. Deploy the fiber cable (Chapter 5.5. and connect it.

5.5. Connecting and Managing the Fiber Cable

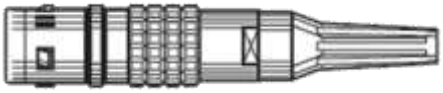
Care should be taken when deploying and managing the fiber cable between the CopperHead Pro Camera Unit and Base Station or throwdown power supply (MPS or HDX).

5.5.1. Planning the Fiber Cable Route

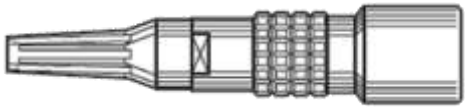
Planning the fiber cable route requires common sense and the ability to foresee the unforeseen. The following should be considered when the fiber cable route is planned:

1. The route should be shorter than the length of available cable.
2. The cable run should be protected. While tactical fiber is extremely durable it is not immune to damage. Hybrid cable is even more fragile than tactical cable and should not be exposed to harsh environments.
3. Avoid possible interference (physical) with the cable that might cause it to bend or kink to an extent that unacceptable signal loss occurs.
4. The cable should not cause a tripping or tangling hazard with people, animals or vehicles.
5. If using cable with OpticalCON or MX connectors, the fiber cable can be unspooled from Base Station location or the camera location. Typically the reel is kept close to Base Station. However if there is a chance the camera may need to move further away from Base Station after initial placement, it makes sense to place the reel at the camera end.

6. If using hybrid cable with SMPTE 304M connectors, make sure that you unspool the “Male” end toward the camera and the “Female” end toward Base Station.



SMPTE 304 “Male” connector (Camera End)



SMPTE 304 “Female” connector (Base Station End)

7. Make sure there is enough slack cable to accommodate a well-managed connection to the camera.

5.5.2. Running the Fiber Cable

The following should be considered when deploying the fiber optic cable:

1. Both ends of the fiber cable must be securely capped. ANY dirt in the connector can adversely affect optical performance and potentially cause signal to be lost.
2. The hub end of the fiber cable (the connector in the reel’s center hub) must not be connected to a receptacle before unspooling the fiber cable, as severe damage to the cable could occur due to extreme spiraling of the connected portion of the cable.
3. The hub end of the cable reel must be securely contained within the reel hub. A loose connector can bang around and be damaged.
4. Prior to connecting any fiber connector, inspect it visually. Fingerprints or other dirt or dust on the optical connectors will reduce the optical signal level on the fiber. If required, clean the connector(s) with fiber cleaning tools. Dry compressed air or with technical wipes that have been moistened with isopropyl alcohol, but never use alcohol or wet cleaning without a way to ensure that it does not leave residue on the endface. It can cause damage to the equipment.
5. Once the fiber cable has been connected, be sure to secure and “strain relieve” the cable. Make sure there are no cable hazards in the run. Secure with Cable Guards and/or Gaffers tape to insure safety.
6. When not connected, insure that the fiber optic connectors are always securely capped. This will protect them from damage or dirt and protect you from possible eye damage.

Place the stationary cable connector inside the center of the reel prior to unspooling the cable

Figure 65-Tactical Fiber Cable on OX-Frame Reel

5.6. Insuring a Positive Fiber Link

1. Connect the fiber cable connectors at each end
2. Power up Camera Unit and Base Station or power supply and check the LED ”Link” indicators on each device.
3. Confirm that the LED “Link” indicators on Camera Unit and Base Station are both illuminated **GREEN.** If so, all signals should now be passing between Camera Unit and Base Station.

5.7. Intercom Operation

Intercom controls and indicators are found on the control panel of the CopperHead Pro Camera Unit:

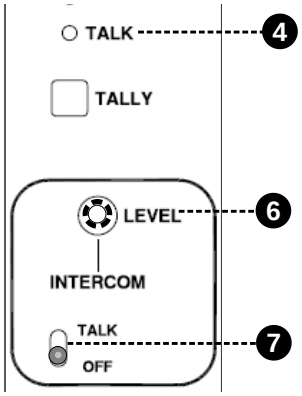


Figure 66- Camera Unit Intercom Controls

❹ Talk

Illuminates **GREEN** to indicate that the intercom TALK switch (❼) is in the "up" position, and that the headset mic is open.

❻ Headset Volume Control Knob

Controls volume ("listen level") of the intercom channel in the headset. Adjust it until the level is comfortable in your ears.

❼ Intercom Talk Switch

"TALK" (up) opens the headset mic

"OFF" (down) closes the headset mic

To talk on the intercom line, toggle the TALK switch to the "up" position, which opens the microphone, transmitting the voice to the intercom line. When the microphone is open, the TALK indicator (❹) will illuminate **GREEN**.

Note: intercom beltpacks cannot be plugged into the CopperHead Pro Camera Unit. Only an intercom headset can be plugged into Camera Unit.

The operation of your specific intercom system is beyond the scope of this User's Guide. Please see the documentation provided with your intercom or consult your intercom provider.

5.8. Shutting Down the System

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

1. Power switches for the camera, Camera Unit and Base Station may be turned off in any order.

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

3. To avoid the possibility of damaging the camera or camera remote control panel (RCP), turn both Camera Unit and Base Station off before disconnecting the CHCR remote cable from the camera or the CHBR remote cable from the RCP.

4. Cap your fiber optic connectors! Keep them clean.

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

6. When re-spooling the cable, avoid cable snags and crimps, and take care not to damage the connectors

7. 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.

8. If Base Station is a permanent or semi-permanent installation then simply power off and disconnect and cap the fiber cable.

5.9. Troubleshooting

Troubleshooting any technical issues with the CopperHead Pro Transceiver 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 the "LINK" indicators at each end of the system. They should be illuminated GREEN if there is good fiber optic connectivity for the non-SDI signals (VBS/sync, camera control, intercom, tally).
2. Check the "SDI" indicator at the CopperHead Pro Base Station. It should be illuminated GREEN if there is good fiber optic connectivity for the SDI signal.
3. If the LINK or SDI indicators are not GREEN, there is likely low optical power between Camera Unit and Base Station. The following actions may remedy this situation:
    a. Insure that all fiber optic connectors are clean. Clean fiber optic connectors are a requirement for reliable connectivity between fiber optic components like your CopperHead transceivers. Any contamination in the fiber connection, even microscopic dust particles, can cause "link loss" and adversely affect the operational functionality of your CopperHead equipment. For more information on the care and maintenance of your fiber optic connectors, please refer to www.telecast-fiber.com.
    b. Examine the entire length of the fiber cable and see that it is in intact and has no damage or severe bends or kinks.
    c. Confirm that all fiber optic connectors are connected securely.
4. If optical power is good, but signals are not being received:
    a. Check all of your copper cables (coax) and connectors (BNC) for damage.
    b. Confirm signal type is on the proper signal path – It is possible to physically connect analog signals to digital signal paths on the CopperHead Pro Transceiver System. However, signals will not pass through the system unless they are the correct type. An SDI signal will not pass through the Analog or VBS paths and an Analog signal will not pass through an SDI path. If the wrong type of signal is incorrectly connected, the signal LED indicator may illuminate, but no signal will pass through.
5. Base Station power problems:
    a. 12VDC Base Station: Check that the DC power supply is functioning correctly and connected securely.
6. 110/220 VAC Base Station: Check the fuses. Do not try to multiplex the CopperHead Pro with other fiber optic devices. The CopperHead Pro system is not readily compatible with any active or passive CWDM technologies, including Telecast's TelePort and TeleThon systems.

Appendices

Appendix A. Fiber Optic Systems – Basic Concepts

Fiber optics and fiber optic cable are the core technologies at the heart of the Telecast Fiber Systems CopperHead Pro Transceiver 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 CopperHead System. The theory and operation of Fiber Optics is beyond the scope of this document. However, it is important to understand the different types of fiber optic cable and fiber optic cable connectors.

Appendix. A.1. Fiber Optic Cable

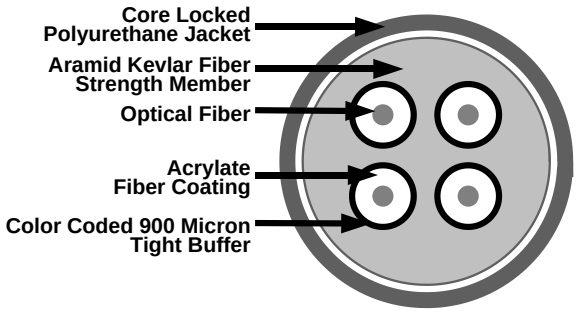


Figure 67 - Tactical Fiber Optic Cable Cross-section (Tac-4 cable shown)

Tactical fiber cables are extremely strong, lightweight, and rugged cables designed for "harsh environment" (military and commercial) deployment & retrieval applications. The internal glass fiber optic cores are protected by a woven aramid (Kevlar) strength member, making them able to withstand a variety of environmental hazards such as being crushed or run-over. They are available in core counts of 1, 2, 4, 6, and 12. CopperHead systems require a minimum of two cores. Using a totally non-metallic design for electrical isolation; they are impervious to noise & grounding issues. Tactical Fiber can be used in the field mounted on lightweight reels in lengths up to 2000 feet or longer

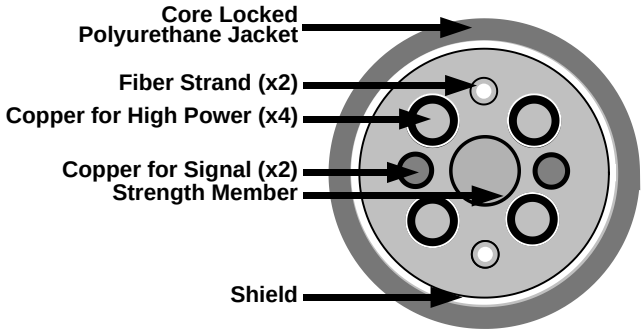


Figure 68 - Hybrid Fiber Optic Cable Cross-section (Illustrative only)

Hybrid fiber cable has two fiber optic cores, with the addition of six copper wires, providing for the transmission of power through the cable in order to provide power to the camera. These copper wires increase the size (diameter) and weight of the cable, and make the cable more fragile than Tactical cable, as well as making them susceptible to noise and grounding issues.

Appendix. A.2. Fiber Optic Connector Types

Depending on the type of fiber optic cable used, different connectors can be used. The following table summarizes the various types of connectors typically used in a CopperHead Pro Transceiver System configuration and the allowed Fiber optic cable usage. Each connector type is illustrated below.

Connector Type	Tactical Fiber Use	Hybrid Fiber Use	Camera Unit Use	Base Station Use	Notes
ST Fiber Connectors	Yes	No*	No	Yes	Less Expensive – not as durable as OpticalCON, SMPTE 304M or MX
ST Fiber Connectors with Molex Power Plug	No	No*	No	Yes	Used with separate Fiber and Power cables
LC Connectors	No	No*	No	No	Infrastructure and Internal Equipment Use
SMPTE 304M	No	Yes	Yes	Yes	
OpticalCON Cable Connector (Neutrik)	Yes	Yes (up to 95V)	Yes	Yes	
OpticalCON Panel Connector (Neutrik)	Yes	Yes	No	No	Infrastructure Use Only
MX Expanded Beam Connector	Yes	No	Yes	Yes	

*Note: These connectors can be used to terminate individual fibers on a Hybrid fiber breakout adaptor.

Table 6 - Fiber Optic Connector Types & Usage

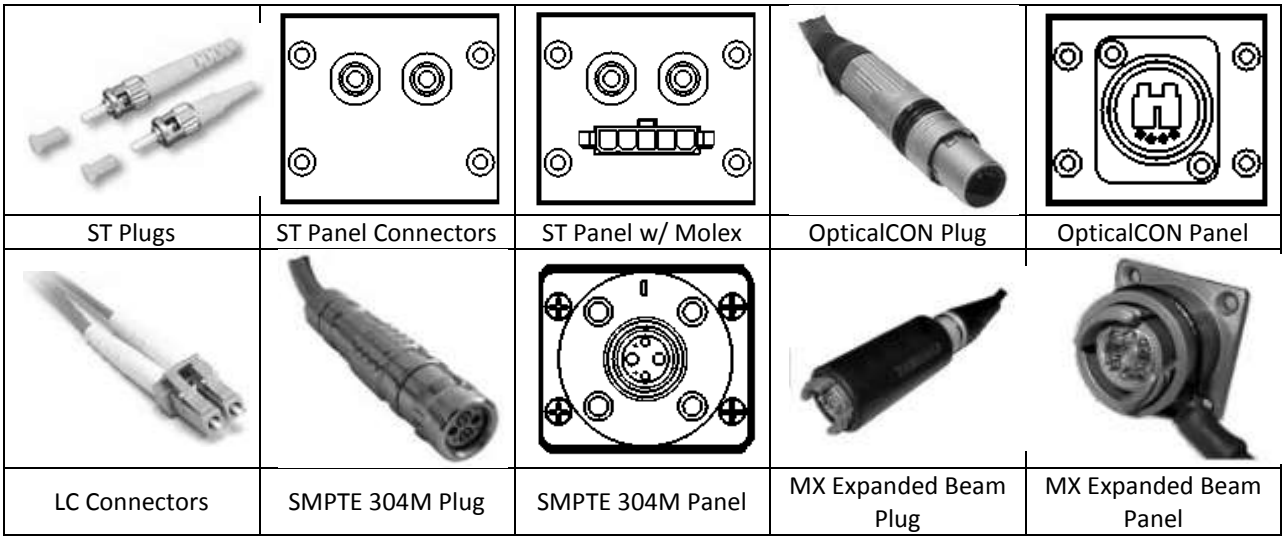


Figure 69 - Fiber Optic Connectors

Appendix B. A Brief Guide to Measurement of Fiber Optic Signal Strength

The CopperHead Pro Transceiver System operates within a defined fiber optic link margin, based on two factors:

a) Output (or "launch") power of the optical transmitter at each end of the link: typically -7dBm* (pronounced as "minus seven dee-bee-em").

b) Sensitivity of the optical detector at each end of the link: typically -22 dBm.

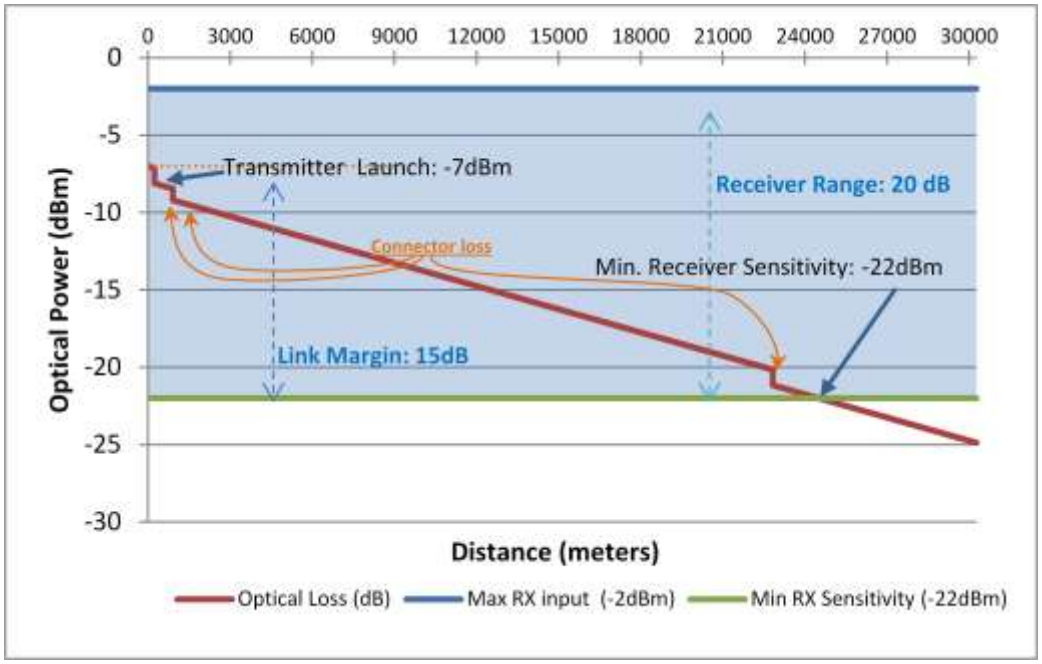


Figure 70 – CopperHead Fiber Optic Link Margin

The overall link margin (or dynamic range) of the CopperHead Pro system (the difference between the transmitter's output power and the receiver's sensitivity) is typically 15dB ("fifteen dee-bee").

That margin is consumed by two main factors:

a) Optical loss over the length of the fiber cable: typically 0.5dB per kilometer

b) Optical loss at connection points: typically 1 dB per connector

Therefore, a CopperHead Pro 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).

However, adding additional devices, such as the HDX or MPS power supply, or the camera-mounted PowerPlus will add connectors to the path, and therefore contribute additional connector loss.

The "SDI" indicator at the CopperHead Pro Base Station illuminates GREEN when the measured optical power at Base Station is -20dBm or better, which is the minimum power requirement for 3.0 Gb/s SDI data. See Appendix F for the optical power requirement for your particular SDI data signal.

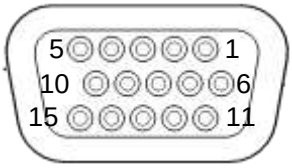
*The unit "dBm" is an abbreviation for the optical power measured in decibels referenced to one milliwatt (mW).

Appendix C. CopperHead Pro System Connectors

Appendix. C.1. Camera Unit Connectors

Reference Numbers Refer to the Overview Diagrams in Appendix G.2.a. at the end of this User Guide

Appendix C.1.a. Camera Remote and Tally



Camera Unit #14
DB15HD Female
(Ext View)

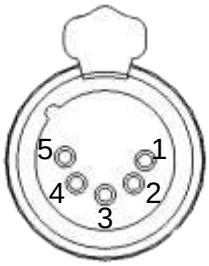
Pin 10
(Data 1 Format select)
Floating for RS-422 or TTL
Tied to GND for RS-232
Tied to +12VDC for RS-485

		Signal			
Function	**Pin #**	**RS232**	**RS422**	**TTL**	**RS485**
Data 1 (Camera Control) RS232/ 422/485	8	IN	(+) IN	IN	(+) I/O
	2	-	(-) IN		(-) I/O
	6	OUT	(+) OUT	OUT	-
	1	-	(-) OUT		-
	10	Data Format			
		Tie to GND	Float	Float	Tie to +12VDC pin 15
	5, 7	GND			
Format Bias	15	Format Bias +12VDC			
GPIs	13	GPI/Relay Output Contact A			
	14	GPI/Relay Output Contact B			
Data 2 (RS422 only)	3	N/A	(-) IN	N/A	N/A
	9	N/A	(+) IN	N/A	N/A
	11	N/A	(-) OUT	N/A	N/A
	12	N/A	(+) OUT	N/A	N/A
Not Used	4	Future			

Camera Unit remote DB15HD pinout

Please see Appendix. D.1. for a list of Camera Remote Cables.

Appendix C.1.b. Camera Headset



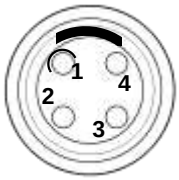
Camera Unit #13
XLR5 Female
(Ext View)

Pin	Signal
1	MIC Ground (shield)
2	+ MIC Input
3	- Earphone Output Ground
4	+ Earphone Output
5	+ Earphone Output

Camera Unit headset connector pinout

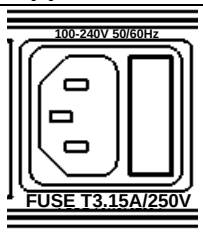
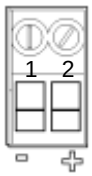
(RTS standard monaural headset pin-out)

Appendix. C.1. Camera Unit Connectors (cont)

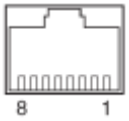
Appendix C.1.c. PowerWafer Connector	
 **Camera Unit #15** **Lemo 4-pin Female** **(Ext View)**	<table><tr><th>Pin</th><th>Signal</th></tr><tr><td>1</td><td>+ 95VDC</td></tr><tr><td>2</td><td>Not Used</td></tr><tr><td>3</td><td>- 95VDC</td></tr><tr><td>4</td><td>Not Used</td></tr></table>**Camera Unit PowerWafer Connector pinout** Receptacle: Lemo EGG.0B.304.CLL Mating connector: Lemo FHG.0B.304.CLAD42 (right angle) Lemo FGG.0B.304.CLAD42 (straight)

Appendix. C.2. Base Station Connectors

Reference Numbers refer to the Overview Diagrams in Appendix G.2.a. at the end of this User Guide

Appendix C.2.a. AC Power Input Connector- Models CHG3-BS-Pro-95VD-xxx-xxx	
 **Base Station #20** **IEC C14 receptacle**	Panel Mounted IEC C14 AC Power Receptacle: 110/220 VAC Fuses: Two 3.15 amp slo-blo fuses (5 x 20mm). Littlefuse Series 218, part #02183.15 or equivalent.
Appendix C.2.b. 12VDC Input Power Connectors – Models CHG3-BS-Pro-2ST/2MX/NEU	
 **Base Station #11** **XLR4 Male** **(Ext View)**	<table><tr><th>Pin</th><th>Signal</th></tr><tr><td>1</td><td>GND</td></tr><tr><td>2</td><td>Unused</td></tr><tr><td>3</td><td>Unused</td></tr><tr><td>4</td><td>+12 VDC In</td></tr></table>**Base Station 12VDC power connector pinout** Connects to ADAP-AC-04 or a customer-supplied 12VDC power supply. This connector is wired in parallel with terminal block #12 (below)
 **Base Station #12** **Terminal block** **(Ext View)**	<table><tr><th>Pin</th><th>Signal</th></tr><tr><td>1</td><td>GND</td></tr><tr><td>2</td><td>+12VDC In</td></tr></table>**Base Station Terminal Block pinout test** Note: This connector is wired in parallel with XLR4 Male #11 (above)

Appendix C.2.c. System Monitor (future use)



Base Station #13
RJ45 8P8C receptacle
(Ext View)

This RJ45 connector is not functional, and is reserved for future use

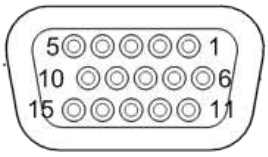
Appendix C.2.d. 95VDC output: Model CHG3-BS-PRO-95VD-STM-xxx

Base Station #14F
Mating connector:
Molex 39-01-4051

Pin	Function	Wire Color
1	+95VDC Out	White*
2	+95VDC Out	Black*
5	Ground	Green

Molex Connector pinout
***Tied together at terminal lug end**

Appendix C.2.e. Base Station Remote/Tally Connector



Base Station #15
DB15HD Female
(Ext View)

Pin 10 (Data 1 Format select)
Floating for RS-422 or TTL
Tied to GND for RS-232
Tied to +12VDC for RS-485

		Signal			
Function	**Pin #**	**RS232**	**RS422**	**TTL**	**RS485**
Data 1 (Camera Control) RS232/ 422/485	8	IN	(+) IN	IN	(+) I/O
	2	-	(-) IN		(-) I/O
	6	OUT	(+) OUT	OUT	-
	1	-	(-) OUT		-
	10	Data Format			
		Tie to GND	Float	Float	Tie to +12VDC
	5, 7	GND			
Format Bias	15	Format Bias +12VDC			
GPI In	4	GPI/Relay Input			
Data 2 (RS422 only)	3	(-) IN			
	9	(+) IN			
	11	(-) OUT			
	12	(+) OUT			
Not Used	13	Future			
	14	Future			

Base Station Remote DB15HD connector pinout

Please see Appendix D for a list of Base Station remote cables.

Appendix C.2.f. 4-Wire Intercom

Base Station #16
XLR5 Female
(Ext View)

Pin	Function	Impedance	Signal
1	Ground		
2	+ Input	600 Ohm	Line: +8 dBm
3	- Input	Input	Mic: -32 dBm
4	- Output	>=600 Ohm	+8 dBm
5	+ Output	Load	

Base Station 4-Wire intercom connector pinout

Appendix C.2.g. Clear-Com Intercom

Base Station #16
XLR3 Female (x2)
(Ext View)

Pin	Signal
1	Ground
2	+ VDC Power
3	Power

Station Clear-Com intercom connector test

Appendix C.2.h. RTS Intercom

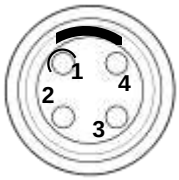
Base Station #16
XLR3 Female
(Ext View)

Pin	Signal
1	Ground
2	+ VDC Power & Channel 1 Audio
3	Channel 2 Audio

Base Station RTS intercom connector pinout

Appendix. C.3. PowerWafer Connector

Appendix C.3.a. PowerWafer Connector



PowerWafer #3
Lemo 4-pin Female
(Ext View)

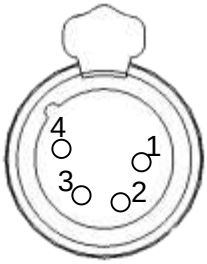
Pin	Signal
1	+ 95VDC
2	Not Used
3	- 95VDC
4	Not Used

Camera Unit PowerWafer Connector pinout

Receptacle: Lemo EGG.0B.304.CLL
Mating connector: Lemo FHG.0B.304.CLAD42 (right angle)
Lemo FGG.0B.304.CLAD42 (straight)

Appendix. C.4. PowerPlus Connectors

Appendix C.4.a. PowerPlus 12VDC Output Connector

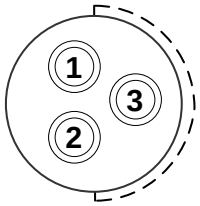


PowerPlus #7
XLR 4-pin Female
(Ext View)

Pin	Signal
1	GND
2	Unused
3	Unused
4	+ Power 12 VDC

PowerPlus 12VDC Connector pinout

Appendix C.4.b. PowerPlus 24VDC Output Connectors



PowerPlus # 8 & #9
Fischer 3-pin Female
(Ext View)

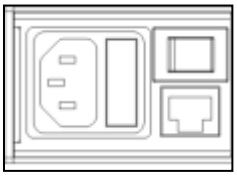
Pin	Signal
1	GND
2	+24VDC
3	Not Used

PowerPlus 24VDC Connector pinout

Mating connectors: Fischer S-102-A-052-130 (straight)
Fischer WSO-102-A0520130 (right angle)

Appendix. C.5. MPS Power Supply Connector

Appendix C.5.a. AC Power Input Connector



MPS Power Interface
IEC C14 receptacle

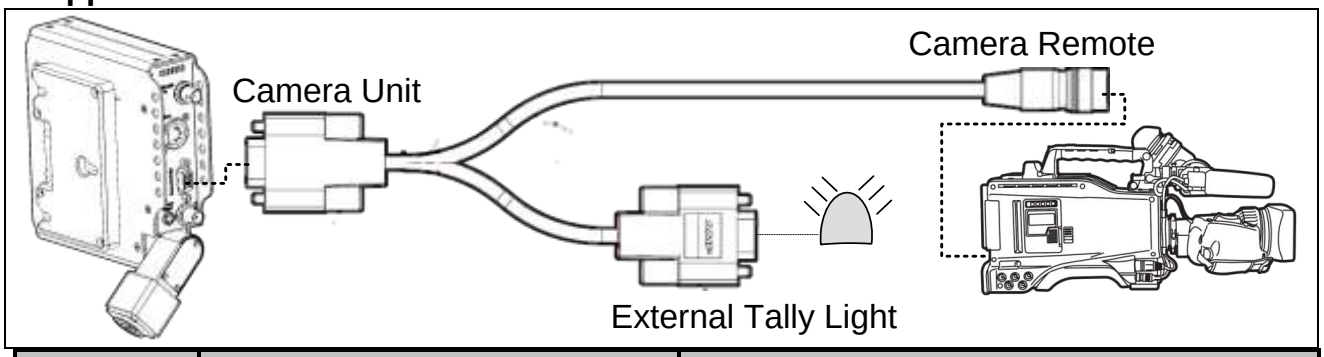
Panel Mounted AC Power Receptacle: 110/220 VAC

Fuses: Two 3.15 amp slo-blo fuses (5 x 20mm).
Littlefuse Series 218, part #02183.15 or equivalent.

Appendix D. Camera Unit & Base Station Interface Cables

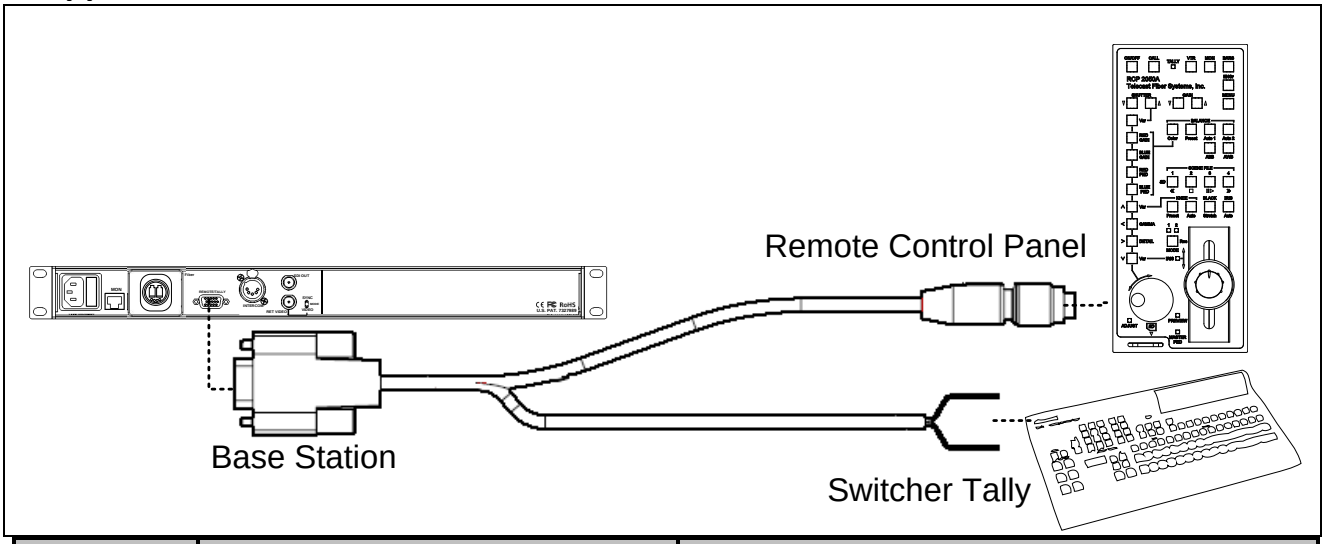
CopperHead Pro systems can be supplied with custom Camera Remote and Base Remote cables for specific cameras and remote control panels. For information on these and other cable configurations please contact Telecast Fiber Systems or your local CopperHead dealer.

Appendix. D.1. CHCR-PRO Camera Unit Remote Cable



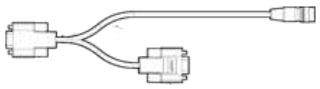
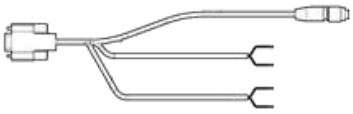
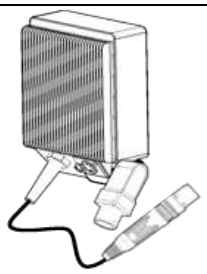
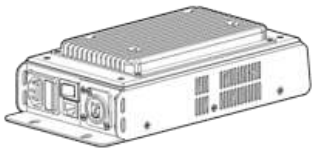
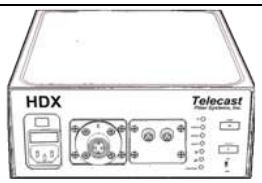
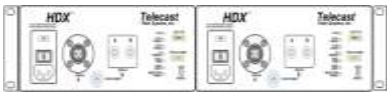
Equipment Mfgr	Model Number	Description
Hitachi	CHCR-PRO-HIT-SK1-4-9	CopperHead Pro camera remote cable for Hitachi cameras
Ikegami	CHCR-PRO-IKE-HK2-10-9	CopperHead Pro camera remote cable for Ikegami HK2-style cameras, such as HL-59, HL-V7X, HK-398P*, HK-387P*, HL-V59**
JVC	CHCR-PRO-JVC1-6-9	CopperHead Pro camera remote cable, for JVC 6-pin "DIN" cameras, such as HD250
Panasonic	CHCR-PRO-PAN-AJ1-6-9	CopperHead Pro camera remote cable for Panasonic AJ1 and AJ2-style cameras (using EC3-control), such as HDC27 Varicam, HPX900
Panasonic	CHCR-PRO-PAN-AJ3-10-9	CopperHead Pro camera remote cable for Panasonic AJ3-style cameras (using RC10-control), such as HDX900, HPX500/2000/2700/ 3000/3700
Sony	CHCR-PRO-SON-DXC2-10-9	CopperHead Pro camera remote cable for Sony DXC2-style cameras, such as DXCD30, D35, D50
Sony	CHCR-PRO-SON-BVP3-8-9	CopperHead Pro camera remote cable for Sony BVP3-style cameras (using Series 700control), such as HDW, PDW, PMW, some DSR.

Appendix. D.2. CHBR-PRO Base Station Remote Cable



Equipment Mfgr	Model Number	Description
Hitachi	CHBR-PRO-HIT-SK1-4-PIG2	CopperHead Pro base remote cable for Hitachi camera controllers
Ikegami	CHBR-PRO-IKE-HK2-10-PIG2	CopperHead Pro base remote cable for Ikegami HK2-style cameras, such as HL-59, HL-V7X, HK-398P*, HK-387P*, HL-V59**
JVC	CHBR-PRO-JVC1-6-PIG2	CopperHead Pro Base remote cable, for JVC 6-pin "DIN" camera controllers, such as RM-LP55 and RM-LP25
Panasonic	CHBR-PRO-PAN-AJ2-10-PIG2	CopperHead Pro base remote cable for Panasonic AJ1 and AJ2-style camera controller, such as AJ-EC3
Panasonic	CHBR-PRO-PAN-AJ3-10-PIG2	CopperHead Pro base remote cable for Panasonic AJ3-style camera controllers, such asAJ-RC10G and AJ-EC4
Sony	CHBR-PRO-SON-BVP3-8-PIG2	CopperHead Pro base remote cable for Sony BVP3-style camera controllers (using Series 700 control), such as RMB150/750)
Sony	CHBR-PRO-SON-BVP3-8-BNC-PIG2	CopperHead Pro base remote cable for Sony BVP3-style camera controllers (using Series 700 control), such as RMB150/750 with Video display)
Sony	CHBR-PRO-SON-DXC2-10-PIG2	CopperHead Pro base remote cable for Sony DXC2-style camera controllers, such as RCP-D50)
Telecast OCP	CHBR-PRO-OCP2040-422-PIG2	CopperHead Pro base remote cable for Telecast RCP2050 Universal Controller (RS422)

Appendix E. CopperHead Pro Parts & Accessories

CHCR-PRO Camera Remote Cable (specify camera model).		**CHBR-PRO** Base Remote Cable, 10 foot (specify controller model)	
PWRWFR-95VD Power Wafer Camera Adaptor (for use with CH Series Pro-BS-95VD)		**PWRPLS3** Long Distance "PowerPlus" Camera Adaptor for use with HDX (specify LP or HP)	
CH2-MPS-95VD External Power Supply for PowerWafer		**HDX** Power Supply for PowerPlus Power Adaptor	
CH3CP-INF-2FAG PowerWafer-to-Camera Unit jumper cable		**HDX-FR-2** Rack mount frame for 2 HDX units.	
CHRCP-2050A Universal Camera Control Panel		**CHRCP-2050-LCD** Universal Camera Control Panel w/TFT-LCD Display	
CASM/MD/XL Tactical Fiber on Reel: Small (SM), Medium (MD), or Large (XL)		**ADAP-AC-04** Base Station AC Adaptor (for CH Series Pro-BS-2ST)	

Appendix E, CopperHead Pro Parts & Accessories (cont)

CAXX-MX Tactical Fiber Assembly, MX Connectors		**CAXX-XT2S-NOC** Tactical Fiber Cable Assembly, OpticalCON Connectors	
CAXX-XSM311-NOC SMPTE 311M Hybrid Fiber Cable Assembly, OpticalCON connectors		**CAXX-XSM311-SMPTE** SMPTE 311M Hybrid Fiber Cable Assembly, SMPTE 304M connectors	
MXRE MX Receptacle Flange Mount Assembly Breakout to STs		**MXRV** MX Receptacle Jam Nut Assembly Breakout to STs	
CH3BFC-NOC-2ST/MOL OpticalCON receptacle to STs and Molex 39-01-4051		**CH3BFC-NOC-NOC** OpticalCON receptacle to OpticalCON Plug	
CH3BFC-304M-2ST SMPTE Hybrid 304M plug to STs and Molex 39-01-4051		**CH3BFC-304M-NOC** SMPTE Hybrid 304M plug to OpticalCON Plug	

Appendix F. Specifications

Video, Digital (SDI)

Interface	SMPTE 259M, 292M, 424M
Data Rate	270 Mb/s, 1.5 Gb/s, 3 Gb/s
Input Level	800 mV +/-10% (peak to peak, maximum)
Equalized cable lengths (Belden 1694A)	
270MB/s	250m
1.5 Gb/s	230m
3 Gb/s	140m
Input/Output Impedance	75 Ohms
Bit-Error Rate (pathological data)	10-12
270MB/s	-24 dBm
1.5 Gb/s	-22 dBm
3 Gb/s	-20 dBm
Jitter (SMPTE color bars)	
270MB/s & 1.5 Gb/s	< 0.2 UI
3 Gb/s	< 0.3 UI
Rise/Fall Times (20%-80% amplitude)	
270 Mb/s	< 1.5 ns to >0.4ns
1.5 Gb/s & 3 Gb/s	< 135 ps

Video, Analog (VBS)

Interface	RS170, NTSC, PAL
Frequency Response	
Return VBS mode	
30 Hz-4.2 MHz:	±0.15 dB
8MHz	-3 dB
Tri-Level Sync Mode	
4.2 MHz	-4 dB
8 MHz	-14 dB
Video Signal to Noise Ratio	≥ 80 dB
Differential Gain	< 2%
Differential Phase	< 1°

Intercom

Number of channels	1
Interface types (Base)	
RTS, Clear-Com (switchable)	XLR 3 Female
Four-Wire	XLR 5 Female
Frequency Response	20Hz - 20KHz +0.1/-3dB
Max Distortion (THD+N)	< 0.1%
Signal/Noise Ratio	>80dB

GPI/Tally

Direction	Base-to-Camera Unit
Input (Base):	
On:	TTL Low or Short to GND
Off:	TTL High or Open
Output (Cam):	2 pos. Form A Relay, SPST, normally open
Max Switching Voltage	125VDC, 150VAC,
Max current	1 Amp

Datas

Data 1 (RS232/422/485 configurable)	
Data rate - RS422 or RS485	0 to 1 Mb/s
Data rate - RS232	0 to 100 kb/s
Jitter (sample asynchronous)	80 nsec
Data 2 (RS422)	
Data rate	0 to 1 Mb/s
Jitter (sample asynchronous)	80 nsec

Electro-Optical

Operating Wavelengths	
Camera to Base (SDI)	1300 nm (Fiber A)
Camera-to-Base (Data/Comms)	1300nm (Fiber B)
Base to Camera (VBS, Data, Comms)	1550nm (Fiber B)
TX Laser output power	-6 dBm
RX Sensitivity,	
270MB/s	-24 dBm
1.5 Gb/s	-22 dBm
3.0 Gb/s	-20 dBm
Fiber Compatibility	Single Mode only
Optical Connector Options - Camera Unit:	
Local Power, PowerPlus...	MX, OpticalCON, SMPTE 304M
PowerWafer:	SMPTE 304M or OpticalCON
Optical Connector Options - Base Station:	
Unpowered (Tac fiber)	ST or OpticalCON
Remote Power (Hybrid fiber):	
Standard Power	SMPTE 304M, OpticalCON, or ST/Molex

Distance Limit * [see note below]

Tactical Fiber (Local Power at Camera):

"Dry" fiber (1.5Gb/s)	16 db optical loss (≈ 30 km*)
SMPTE 311M Hybrid Fiber	
Standard Internal Power Supply w/PowerWafer	
	240m (787 ft): 95W @ 12VDC*
Long Range: HDX w/PowerPlus	
	2km (6562 ft.): 100W Cont./150W Peak*

Mechanical/Environmental

Dimensions (WxLxD)

Camera Unit	2.5" x 6.5" x 2.2"
Base Station	17.5" x 9" x 1.75"
PowerWafer	5" x 6.12" x 2.2"
PowerPlus LP (100W)	5" x 6" x 2.5"
PowerPlus HP (150W)	5" x 6" x 3.7"
HDX	13" x 3.5" x 8.5"
MPS Power Supply	9.7" x 2.5" x 4.5"

Weight

Camera Unit	1.5 lb.
Base Station	5.0 lb.
PowerWafer	1.5 lb.
PowerPlus	LP: 2.3 lb.....HP: 2.5 lb.
MPS Power Supply	3.0 lb.
HDX	10.5 lb.

Power Consumption

Camera unit	8 watts@10-18VDC
Base Station (Tac Fiber):	
Power Consumption	10 watts@10-18VDC
Power Connector	4-Pin XLR
Base Station (Hybrid Fiber):	
Power Req	110-120/220-240 VAC, 50 to 60Hz
Power Consumption	250 watts max @120VAC
Temperature Range	-25° to +55°C
Humidity Range	0 to 95% RH, Noncondensing

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

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Appendix G. Overview Diagrams

Appendix. G.1. Camera Unit

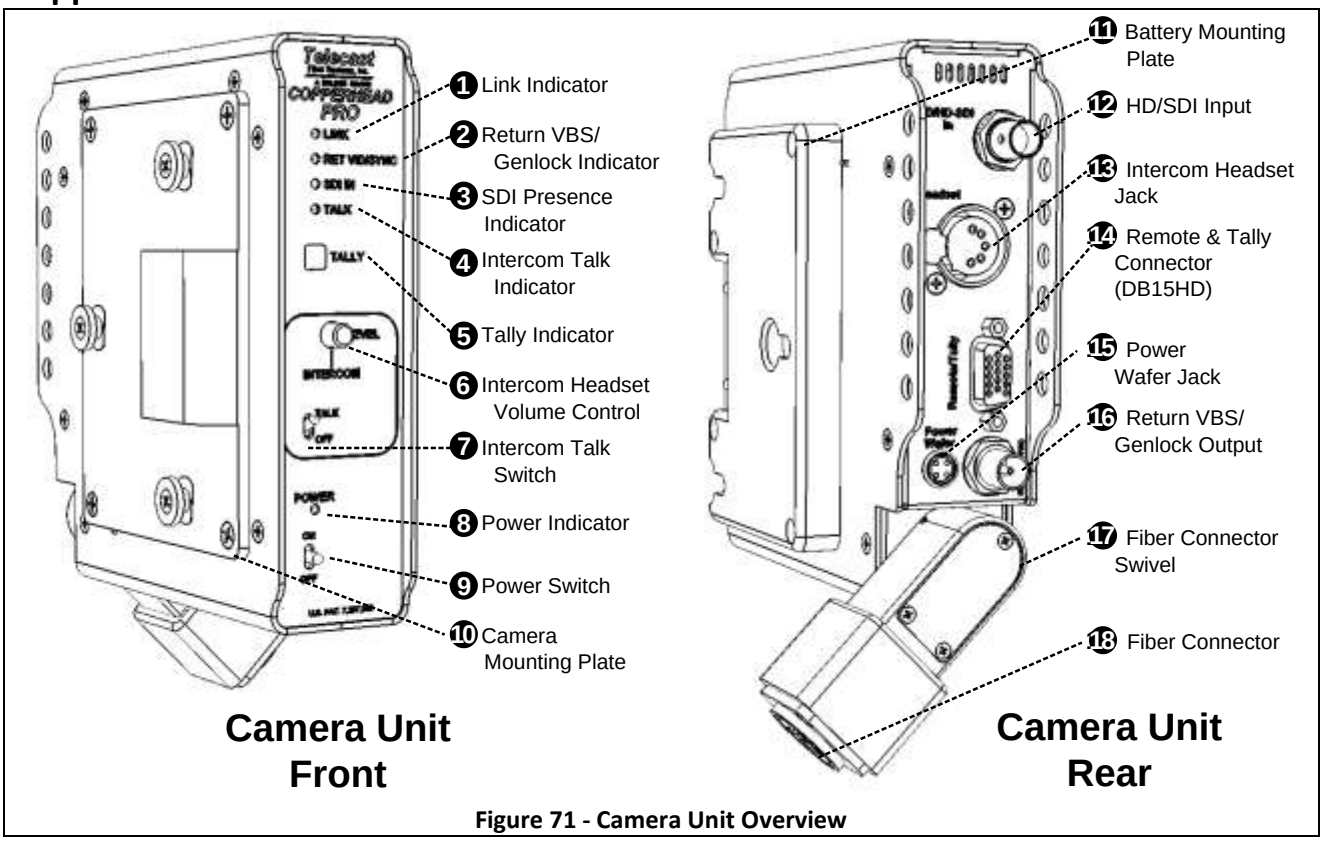

Figure 71 - Camera Unit Overview

Appendix. G.2. Base Stations

Appendix G.2.a. Base Station: 12Volt DC (single/dual)

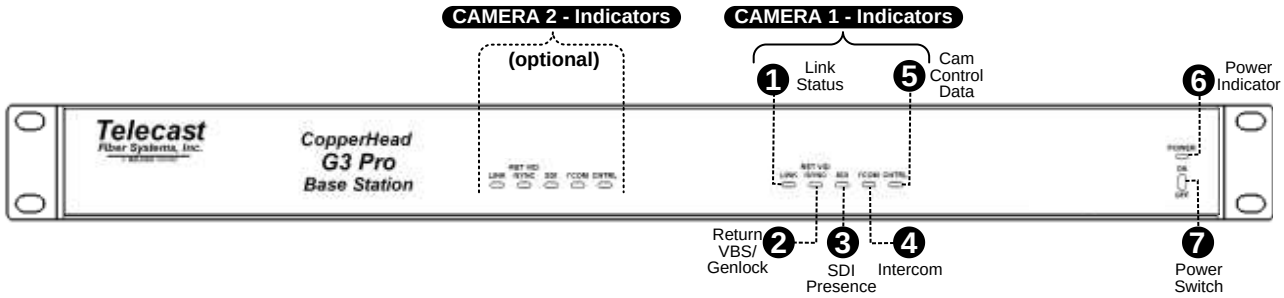

Figure 72 - Base Station – 12 volt DC system, front panel

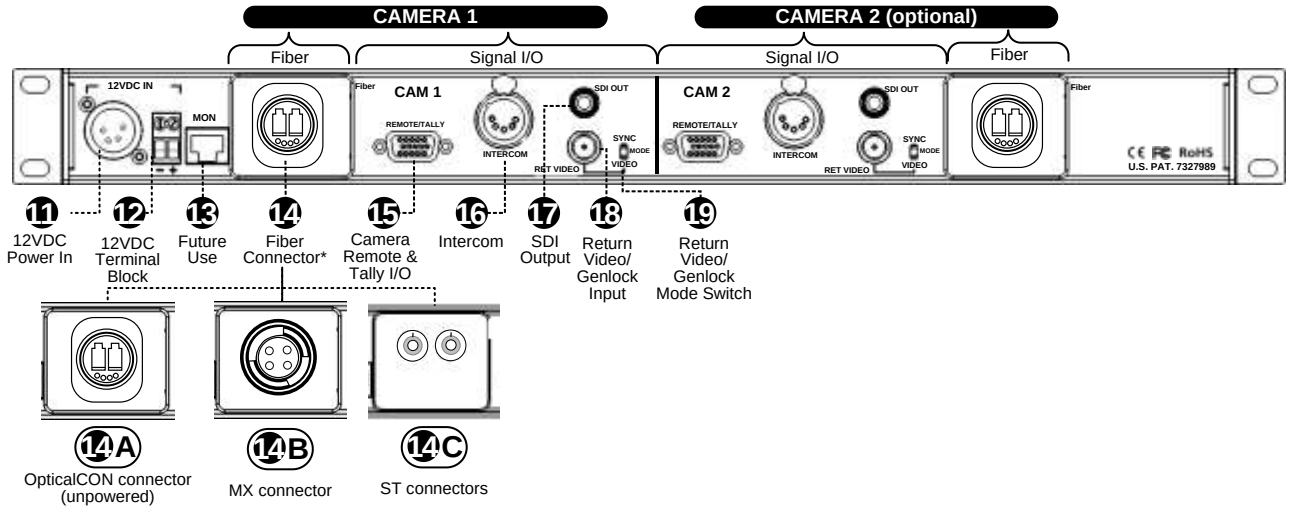

Figure 73 - Base Station – 12 volt DC system, rear panel

Appendix. G.2. continued:

Appendix G.2.b. Base Station: 120/200 Volt AC (single only)

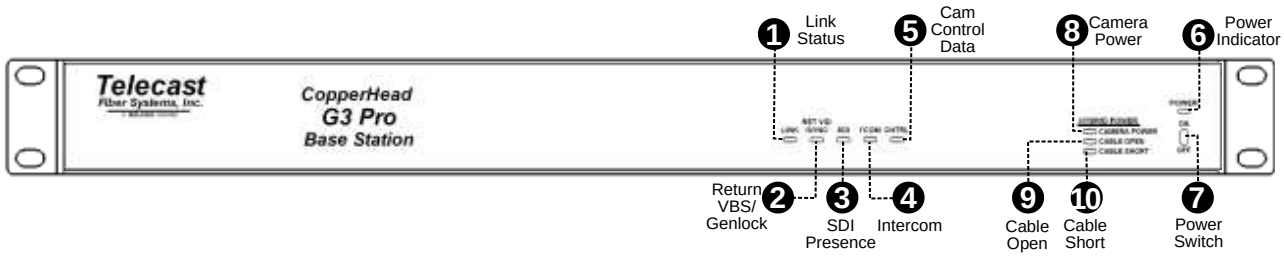

Figure 74 - Base Station – 120/220 volt AC system, front panel

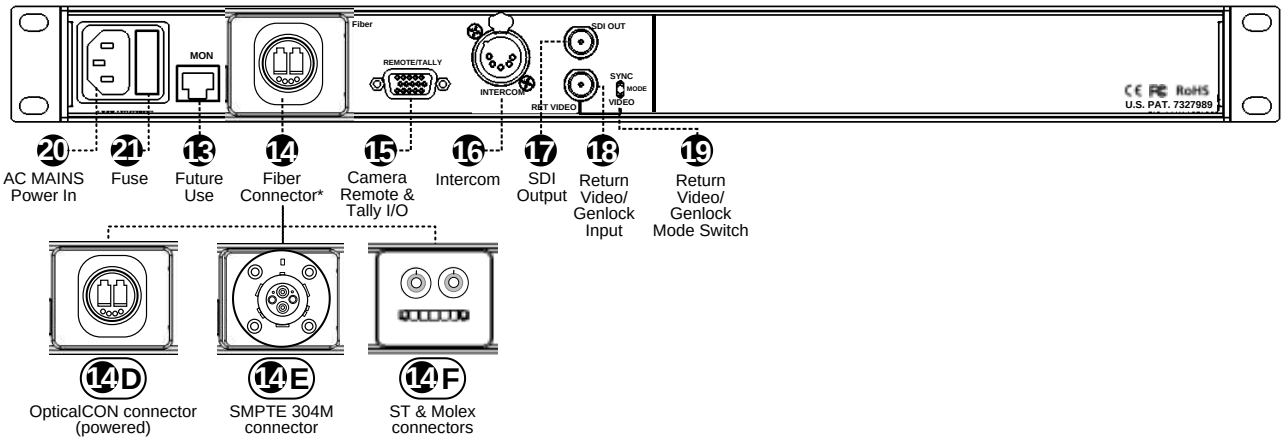

Figure 75 - Base Station – 110/220 volt AC system, rear panel