CopperHead G2
Preliminary Manual

DV400 SLED
DV500 SLED
Multiplexing Optical Engine (MOE)
G2 Base Station

Draft - Draft - Draft - Draft - Draft – Draft

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11/1/06
jbh & hs

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Overview

The new **CopperHead G2** is a camera-mounted fiber optic transceiver system that docks directly to any professional camcorder or non-triax camera, transporting all video, audio, camera control, and communications signals between the camera and a base station. This is accomplished seamlessly and with no signal degradation via a single flexible, lightweight, ruggedized, battlefield-rated tactical fiber optic cable.

The system consists of a Base Station, Fiber Optic Engine, and one of four unique Interface Sleds:

- Base Station: A lightweight 1RU frame located at the "video village" position, or in your truck or control room.

- Fiber Optic Engine: The modular multiplexor that mates with the Interface Sleds to create the CopperHead G2 "Camera Unit."

- Interface Sleds:

    o 2200: For analog composite and component cameras.

    o 2400: Universal Sled for analog composite, Stndard Definition SDI and High-Definition SDI cameras.

    o DV400 and DV 500:

    These Interface Sleds are designed exclusively for Sony's high-end Digital Standard Definition and High Definition camcorders. Utilizing signal conversion technology from industry-leader *Miranda Technologies*, the **CopperHead G2 DV400 and DV500** provide on-board downconversion, serialization and optional DV encoding in the field.

    Combined with the Fiber Optic Engine, the **CopperHead DV** Sleds fit neatly between the camera and the battery, docking directly to the multipin connector integral to the camera's V-Shoe battery mount. There are two versions:

    - The DV400 mounts directly to Sony's digital Standard Definition cameras equipped with the 40-pin interface, such as the IMX, SX, XDCAM and Digibeta series.

    - The DV500 series is for Sony's HDCAM camcorders with 50-pin interfaces, providing the functionality of the HDCA-901 camera adaptor, plus much more.

Because the **CopperHead G2** transmits all signals digitally and optically, you are assured of the highest quality video and audio, free from interference, grounding problems or drifting due to temperature variations. The lightweight tactical fiber cable lets you move faster, farther and with confidence. Or use hybrid copper/fiber cable and the optional CopperHead PowerPlus system to deliver power _and_ fiber optic connectivity.

Now, the limitations associated with HD, SDI and triax are all a thing of the past, as the Copperhead gives you a range of up to 20 kilometers. The ability to save time and effort, while maintaining complete signal integrity, has made CopperHead the undisputed leader in camera-mounted fiber optic systems.

Features:

- All Camera Signals Transported on Lightweight "Tactical" Mil-Spec Fiber Cable:
    - Analog NTSC/PAL Video
    - Digital SDI Video
    - HD/SDI Video (DV500 only)
    - Return Video (NTSC/PAL)
    - Return Black Burst (Genlock / Tri-level sync)
    - 24-Bit Camera Audio (2 ch)
    - 4 Channels Return Program Audio (DV500 only)
    - Return IFB/Audio
    - Two Way Intercom (4-Wire) with IFB Monitoring
    - Tally/Call closure circuit
    - Bi-Directional Camera Control Data
    - Bi-Directional PTZ Control & Time Code
    - Built-in Miranda downconverter includes:
        - Full set of outputs at camera:
            - SDI, Composite and DV/IEEE-1394
            - HD-SDI (DV500 only)
        - HD-SDI, SDI and DV outputs feature embedded audio, and time code
        - Time code burn-in, graticule markers and on-screen Metadata
        - Aspect ratio converter
        - Operates with full range of HD formats and frame rates
        - Full 10-bit quality downconversion
        - Minimal processing delay
        - 3:2 pull-down insertion at 23.97PsF
- Video and Audio Inputs for standalone, off-camera use
- Multipin Interface Sleds directly to 40- and 50-pin connectors on Sony Digital Camcorders
- Multi-kilometer distance capability
- Optimized power consumption for minimal impact on camera battery
- Optional camera power via SMPTE 311M "Hybrid" cable utilizing the **PowerPlus** system
- Optional Downconverter at Base Station provides Composite, SD Analog Component (DV400), and SDI & HD Analog Component (DV500 only)

A. Typical Systems

A1. 2200

A2. 2400

A3. DV400
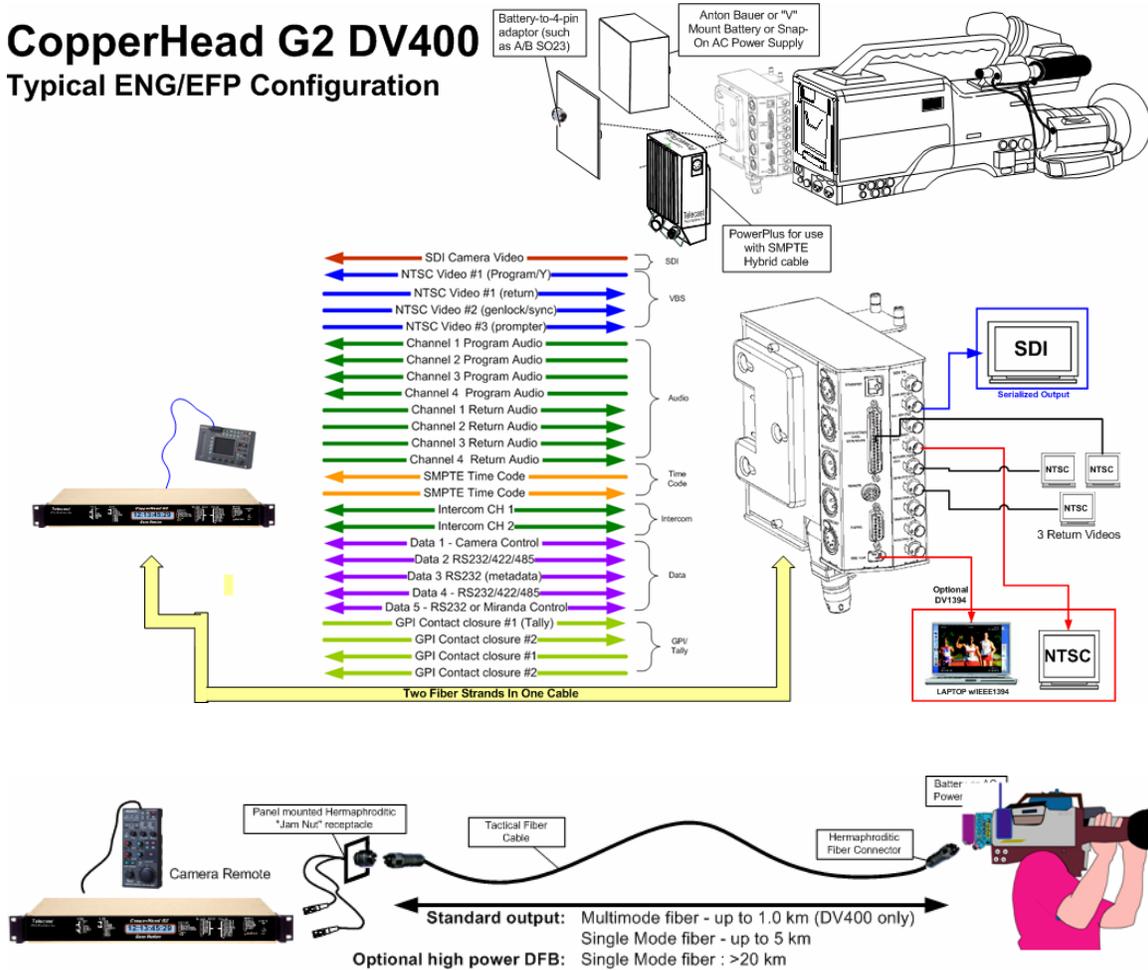
A4. DV500

CopperHead G2 DV500
Typical EFP/E-CINE Configuration
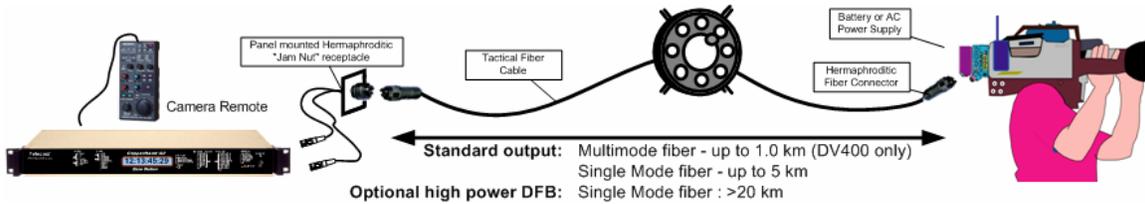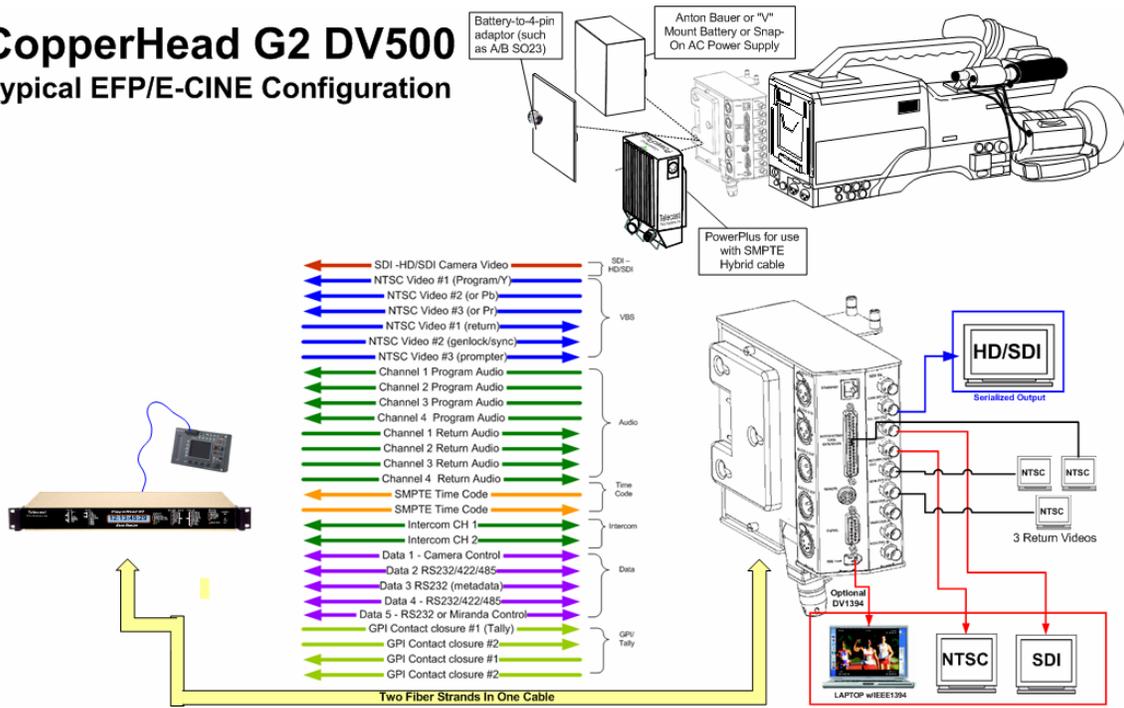
Figure X – System on Tactical Fiber
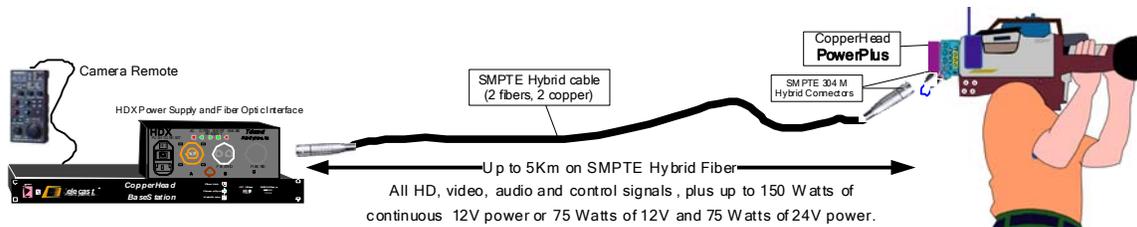
Figure X – System using SMPTE Hybrid Fiber

B. Block Diagrams

B1. 2200

B2. 2400

B3. DV400
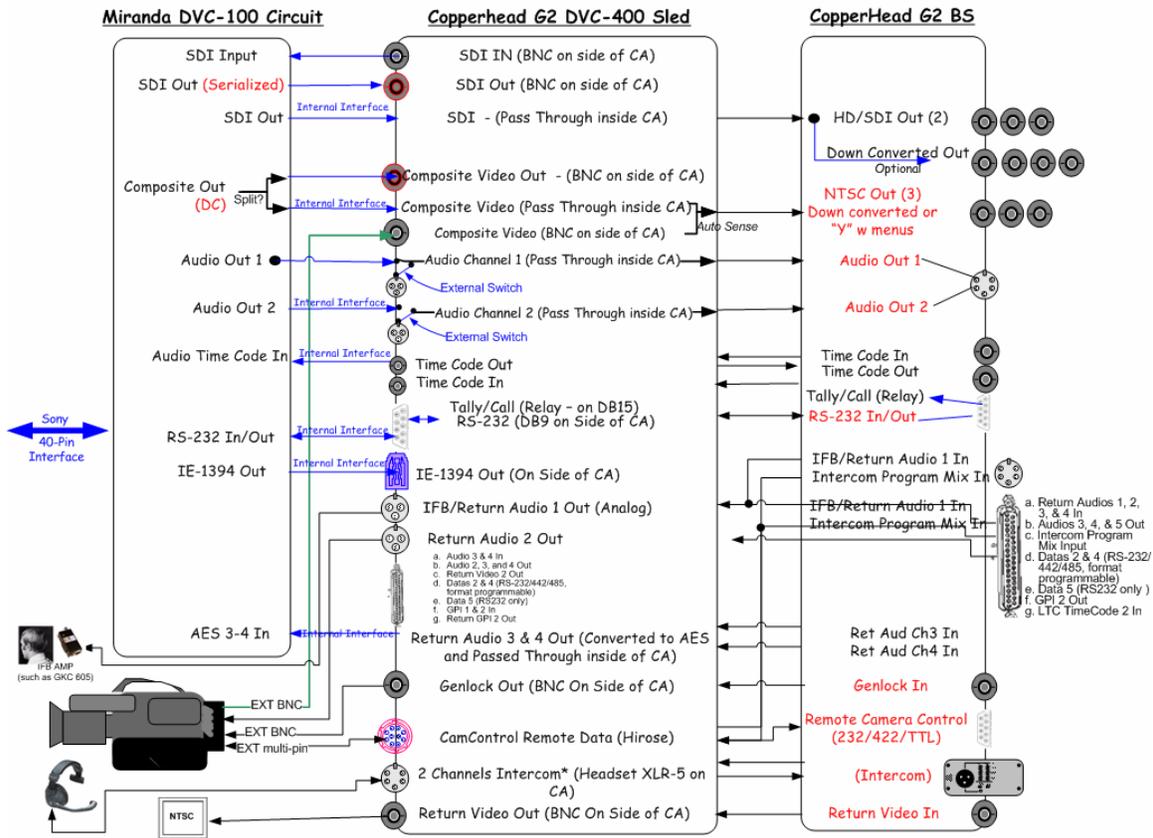
## B4. DV500

Copperhead G2 DV500 for Sony HD-CAM Hi-Def Camcorders
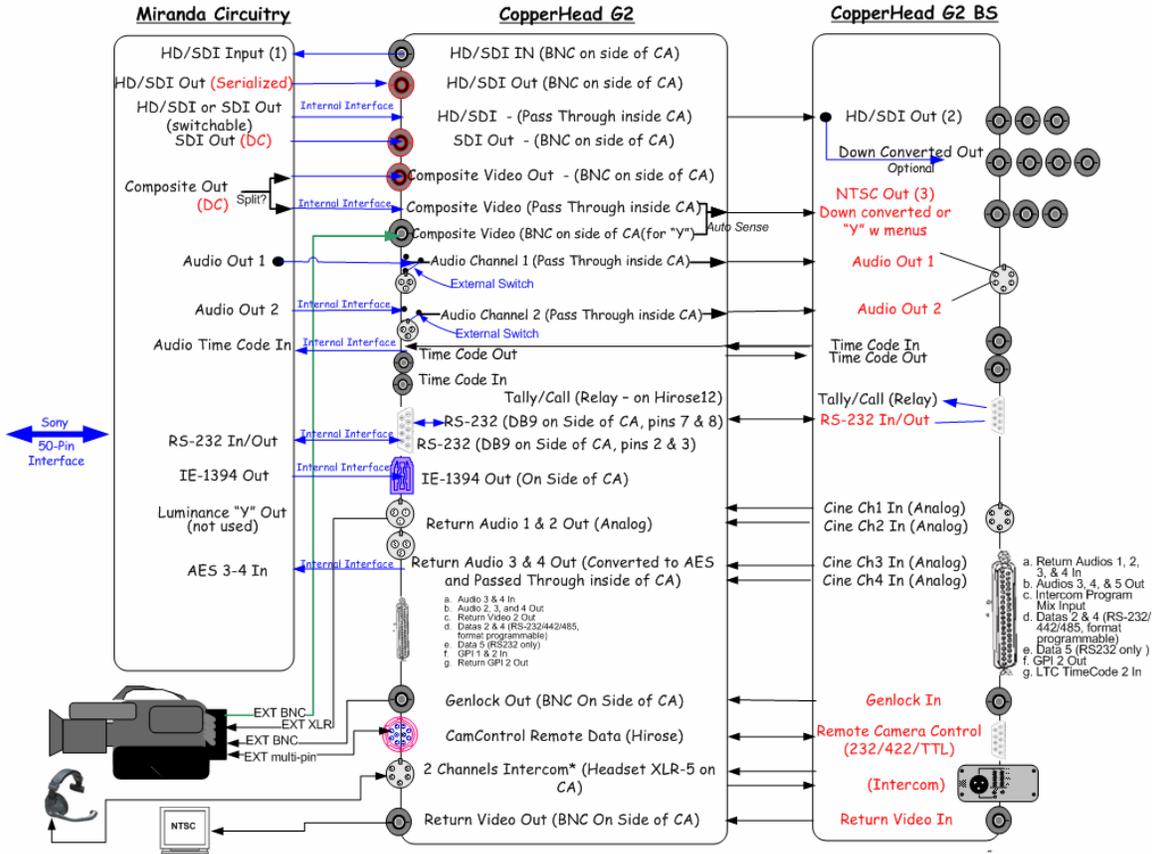
C. Locations and Functions of Parts And Controls

C1. Multiplexing Optical Engine (MOE Module)
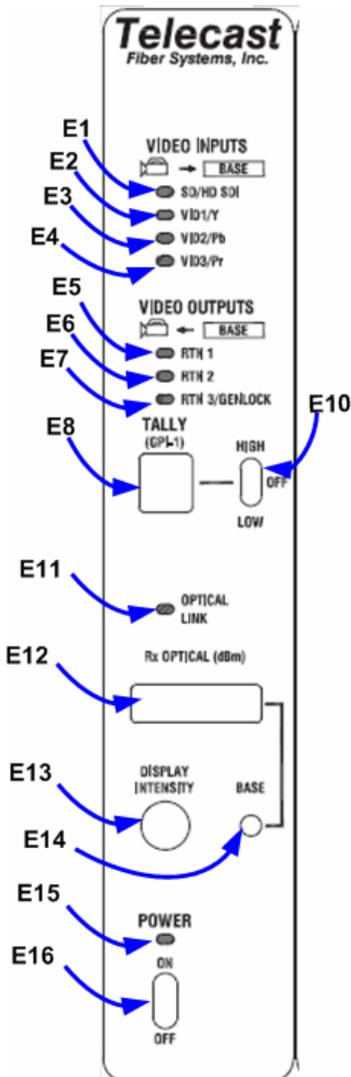
|	
E1-E4	Video Cam to Base Presence Indicators
E5-E7	Video Base to Cam Presence Indicators
E8	On Air Tally
E10	Tally Intensity Selector Switch
E11	Optical Link Status Tally Green - Base to Cam Fiber Link Active Red – Base to Cam Fiber Link Inactive
E12	Optical Power Readout Press Button E14 to see Received Optical Power Release Button E14 to se Transmit Optical Power
E13	Intensity Control for Optics Modules LEDs
E14	Optical Power Selector/Display Switch
E15	Power On LED
E16	Power Switch for Optics Module

C2. Powered Multiplexing Optical Engine (P-MOE Module)

C3. 2200 Sled

C4. 2400 Sled

C5. DV400 Sled

Front Panel

S1-S4	Audio In Presence Indicators
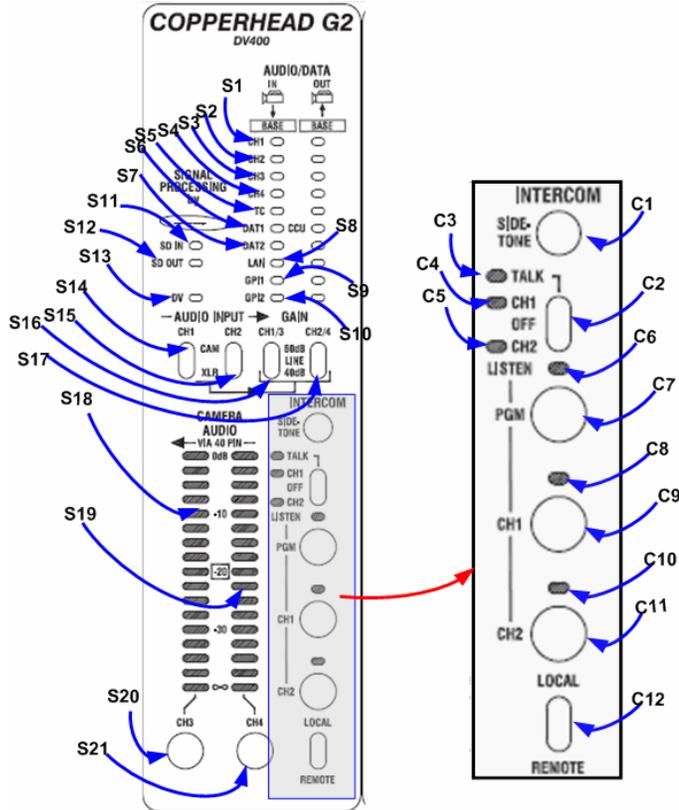
S5 Time Code Presence Indicator

S6-S7 Data 1 & 2 Presence Indicator

S8 LAN Presence (Not Implemented)

S9-S10 GPI Activity Indicators

S11-S14 Video/SDI Presence Indicators

S15-S16 Audio Source Select Switches

S17-S18 Audio Source Gain Select Switches

S19-S20 Audio from Camera Gain Bar Graph

C1 Intercom Sidetone sets how loud you hear yourself speak on intercom channel.

C2 Intercom Channel Select

C3-C5 Intercom Cam to Base Activity Indicators

C6, C8, C10 Intercom Base to Cam Activity Indicators

C7 Intercom Ch Program Input Gain

C9 Intercom Ch 1 Input Gain

C11 Intercom Ch 2 Input Gain

C12 Intercom Activation Toggle
Up Talk On
Middle Talk Off
Down Talk controlled by External Switch on D15 connector

Connector Panel, I/Os
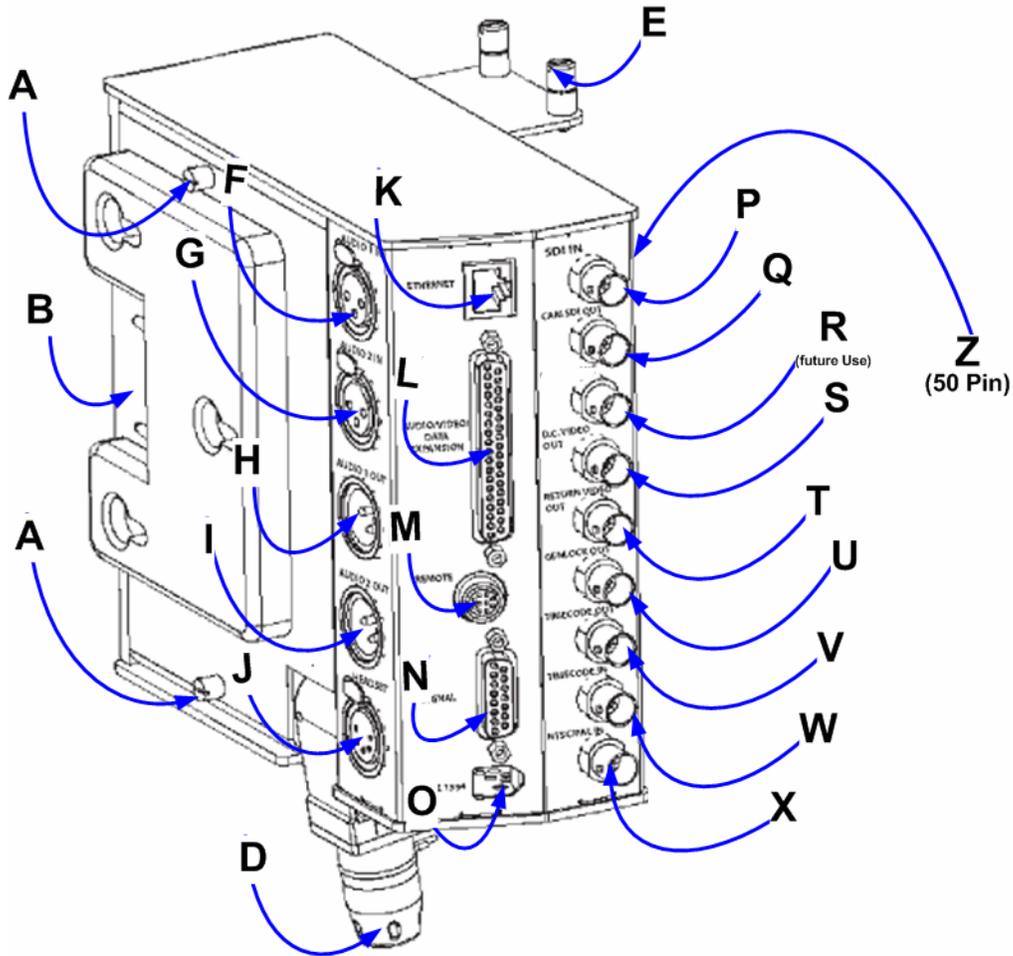
A. Thumbscrew	N. Signal Connector
B. Battery Plate	O. I1394 Firewire out
C. N/A	P. SDI In
D. Fiber (MX)	Q. CAM SDI Out
E. Thumbscrews	R. For Future Use
F. Audio 1 In	S. Downconverted NTSC Out
G. Audio 2 In	T. Return Video
H. Audio 1 Out	U. Genlock Out
I. Audio 2 Out	V. Timecode Out
J. Headset I/O	W. Timecode In
K. Ethernet	X. NTSC/Pal In
L. Audio/Video/Data Expansion Port	Y. N/A
M. Remote Camera Control Connector	Z. 50-Pin Camcorder Connector

C6. DV500 Sled

C7. G2 Base Station

C7a. Base Station Front Panel
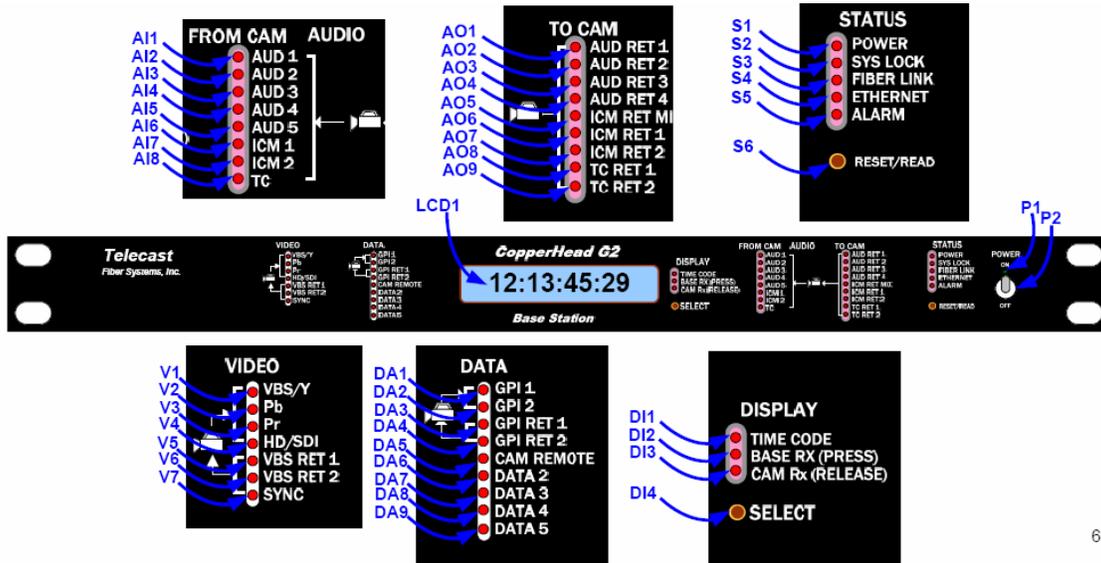
AI1-AI8   Audio From Camera To Base Station

LEDs will light to indicate audio input activity.

AO1-AO9   Audio From Base Station To Camera Unit

LEDs will light to indicate audio output activity.

S1-S5   LEDs for system status

LEDs will light to indicate audio output activity.

S6   Status Reset/Read Pushbutton

Not implemented yet 11/14/06

V1-V7   Video Status Indicator LEDs

LEDs will light to indicate signal presence.

DA1-DA9   Data Status Indicator LEDsLEDs

LEDs will light to indicate signal presence.

DI1-DI4   LEDs tell what is on display and button selects.

Normally displays Time Code of Camera: This feature not implemented 11/14/06

Push button to display Optical Power (in dBm) at Base Station
Release button to display Optical Power (in dBm) at Camera Unit

C7b. Base Station Rear Panel
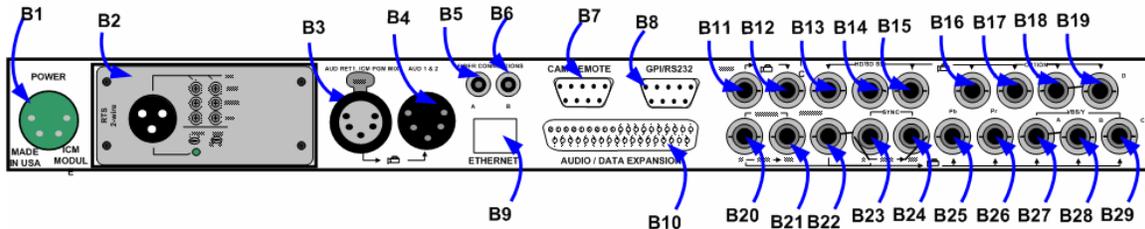
B1: 12VDC input. 4-pin XLR.

B2: Intercom Module:
      Can be equipped with one of the following two-channel intercom modules:
            ADDR-AUX-4W – Universal "Four-Wire" intercom Module
            ADDR-AUX-CC – Clear-Com Intercom Module
            ADDR-AUX-RTS - RTS "TW" Intercom Module

B3: This is a two-channel XLR5 "input" connector. It feeds two independent audio signals to the Camera Unit:

1) Audio Return #1: usually used in ENG for Talent IFB. It comes out on DV400 XLR3M labeled "Audio 1 Out" (#H). Remember that a battery-powered IFB beltpack must be used (such as GKC model 400 - click for link). Audio can be seen visually on the Base Station at LED indicator "TO CAM: AUD RET 1" (#AO1) and on the DV400 sled at the LED indicator "AUDIO/DATA OUT CH1"(LED #S1-B).

2) "Intercom Program Mix": this is the audio source for the intercom program feed that is mixed into the Camera Operator's headset using the pot on the DV400 sled labeled "PGM Listen" (Pot #C7). It does not "go" to any connector on the G2 Camera Unit. It is for operator monitoring only. Audio can be seen visually on the Base Station at LED indicator "TO CAM: ICM RET MIX" (#AO5) and on the DV400 sled at the LED indicator "LISEN – PROGRAM"(LED #C6).

B4: The two Program audio signals from the camera appear here at line level only. These may be the front mic inputs or the rear inputs which is determined by switches on the camera.

B5 & B6 Fiber Ports, Transmit and Receive.

B7:   Camera Remote Port. Use adapter cable CHBR XXX to attach local paint box.

B8:   Rs232 and GPIs. RS-232 for pan,tilt, etc control. GPIs for Tally, etc.

B9.   10/100 Ethernet Link to camera. Not yet implemented.

B10   Audio Data Expansion Port. Has the following signals:
   a. Return Audio 1 In (redundant to one-half of XLR5F "B3")
   b. Return Audios 2, 3, & 4 In
   c. Audios 3, 4, & 5 Out
   d. Intercom Program Mix Input (redundant to one-half of XLR5F "B3")
   e. Datas 2 & 4 (RS-232/442/485, format programmable)
   f. Data 5 (RS232 only – dedicated to Miranda control on GV500)
   g. GPI 2 Out
   h. LTC TimeCode 2 In (Miranda Time Code)

B11   Time Code In to Camera

B12   Time Code Out from Camera

B13-B15 SDI Program from camera. The same signal on all three connectors via internal
Distribution Amplifier (DA).

B16-B19: Optional Internal Downconverter, D-To-A converter, or A-to-D Converter

	DV500	DV400	2400	2200
	Downconverter and D-to-A	D-to-A	Downconverter and D-to-A	A-to-D
Option:	DC	D2A	DC	A2D
B16	SDI	VBS	SDI	N/A
B17	Y or R	Y or R	Y or R	SDI Out 1
B18	Pb or G or VBS	Pb or G	Pb or G or VBS	SDI Out 2
B19	Pr or B	Pr or B	Pr or B	SDI Out 3

B20   Return1 VBS to Camera
B21   Return1 VBS to Camera loop thru

B22   Return2 VBS to Camera to Camera (no loop thru)

B23   Genlock/Sync/Trilevel Sync/Return VBS3 to Camera
B24   Genlock/Sync/Trilevel Sync/Return VBS3 to Camera loop thru

B25   Pb/VBS 2 Out from Camera

B26   Pr/VBS 3 Out from Camera

B27-29   Y/VBS 1 Out from Camera. . The same signal on all three connectors via internal
Distribution Amplifier (DA).

C8. Power Plus

D. Interconnections

D1. 2200 Interconnects

D2. 2400 Interconnects

D3. DV400 Interconnects
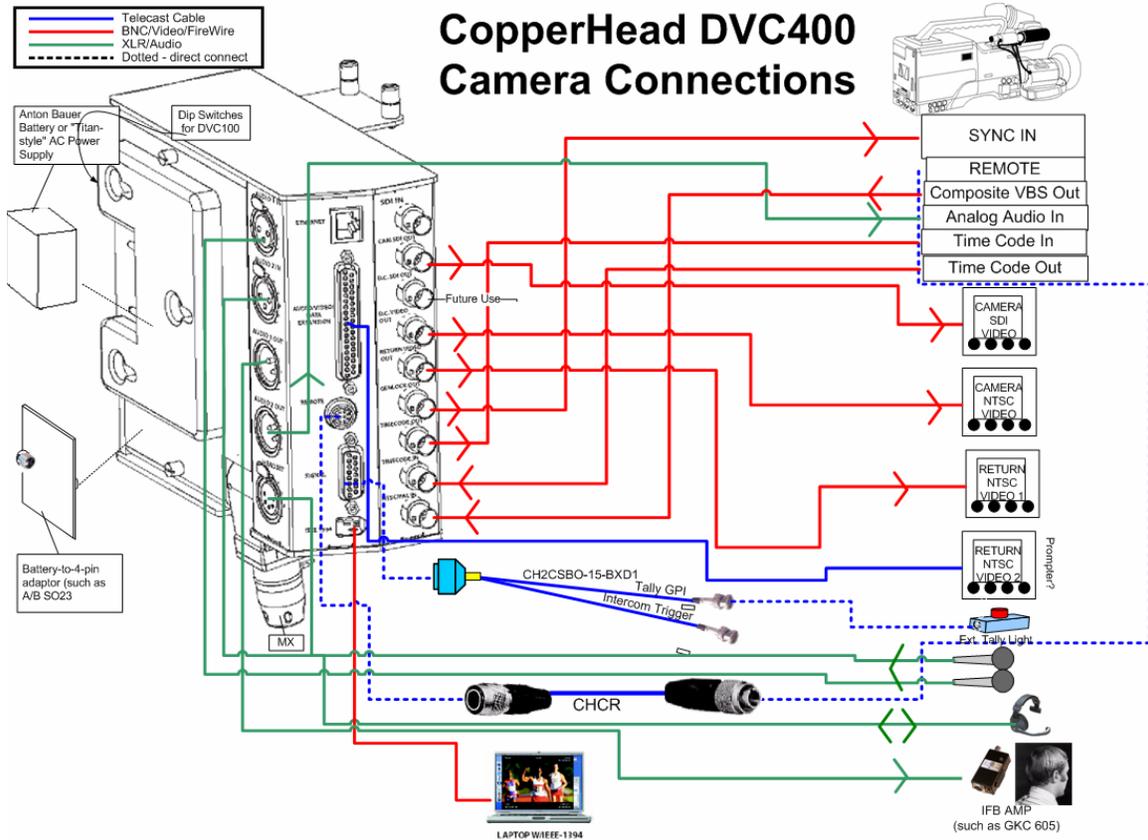
D4. DV500 Interconnects

CopperHead DVC500 Camera Connections
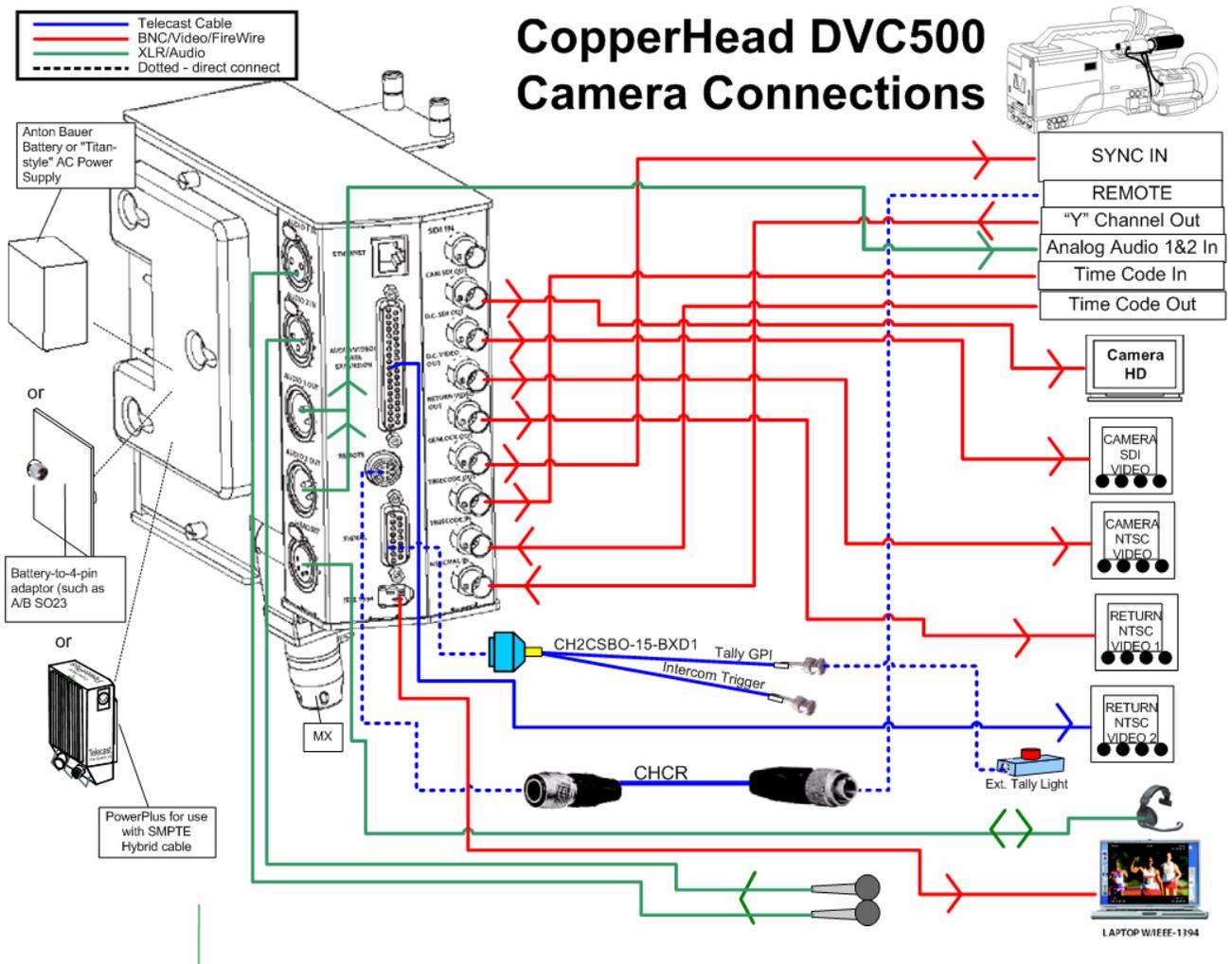
D5. G2 Base Station Interconnects

D5a. G2 Base Station with Tactical Fiber
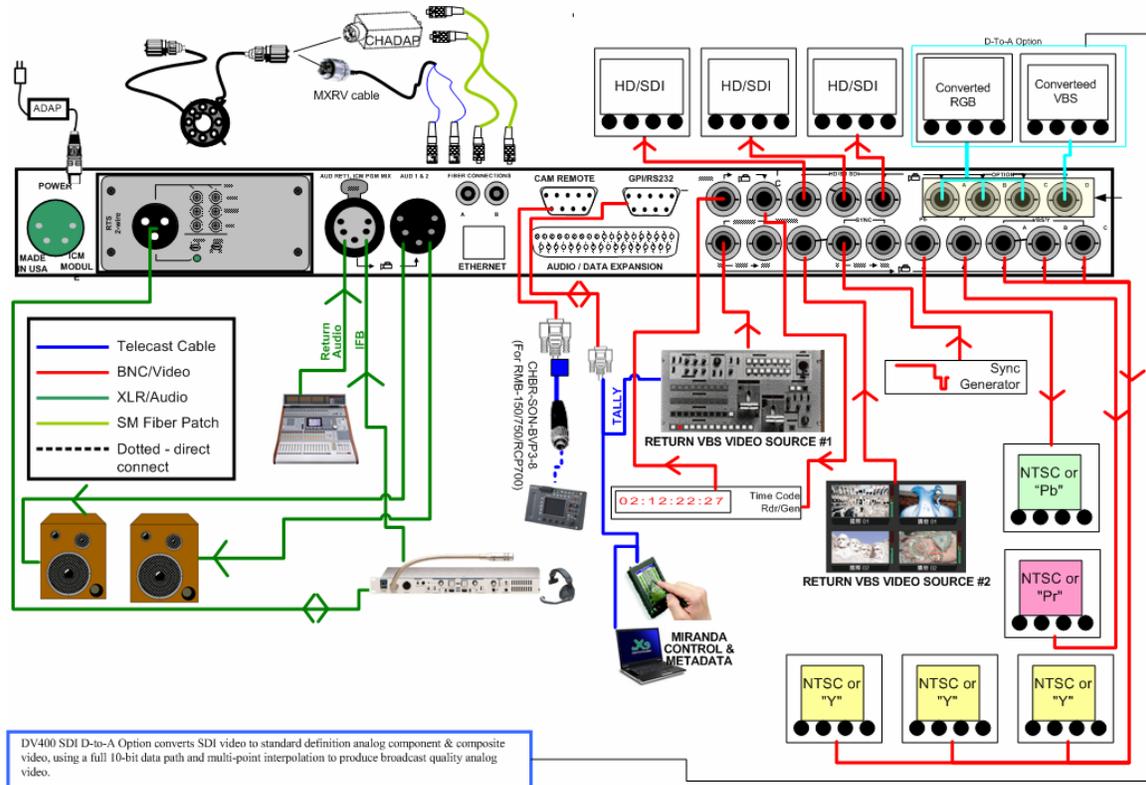
D5b. G2 Base Station with SMPTE Hybrid Fiber

E. Connectors

E1. 2200 Connectors

## *E2. 2400 Connectors*

E3. For Future Use

E4. DV400 & DV500 Connectors

L - Audio/Video/Data Expansion Port
DB37 Female Connector

Data 5 In (RS232) - Miranda Control	1
Data 5 Out (RS232) - Miranda Control	20
Data 4 In (-)	21
Data 4 In (+)	3
Data GND	22
Data 4 Out (-)	4
Data 4 Out (+)	23
Data 4 Program	5
+12VDC for Format	2
Data 2 In (-)	24
Data 2 In (+)	6
Data GND	25
Data 2 Out (-)	7
Data 2 Out (+)	26
Data 2 Program	8
GPI 2 In B	27
GPI 2 In A	9
GPI GND	28
GPI 2	10
GPI 1	29
AUD GND	11
Audio 4 In (-)	30
Audio 4 In (+)	12
AUD GND	31
Audio 3 In (-)	13
Audio 3 In (+)	32
AUD GND	14
Audio 2 In (-)	33
Audio 2 In (+)	15
AUD GND	34
Aud 4 (-)	16
Aud 4 (+)	35
Aug GND	17
Aud 3-	36
Aud 3+	18
Ret Vid Out Gnd	37
Ret Vid out (X)	19

M – Signal Port
DB15 Female Connector
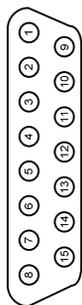
Return Video Out X	1
Return Video Out G	9
GND	2
Video Input 1 (Y) X	10
Video Input 1 (Y) G	3
Ret GPI1 A	11
Video Input 2 (Pb) X	4
Video Input 3 (Pr) X	12
Genlock Out X	5
Return GPI1 B	13
Headset Mic Trigger	6
+12V BIAS	14
AUD GND	7
Cam Audio In 5 (-)	15
Cam Audio In 5 (+)	8

E5. G2 Base Station Connectors

B1 – 12 VDC Input
Male XLR4
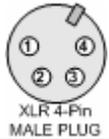
	Pin 1	GND
	Pin 2	Not Used
	Pin 3	Not Used
XLR 4-Pin MALE PLUG	Pin 4	12 VDC (+)

B3 – "Return Channel 1" & "Intercom Program Mix"
Female XLR5 – Inputs
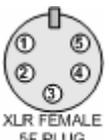
	Pin 1	GND – Common for "Return Ch 1" & "Intercom Program Mix"3
	Pin 2	Return Ch 1 (IFB) Input +
	Pin 3	Return Ch 1 (IFB) Input –
XLR FEMALE 5F PLUG (solder side)	Pin 4	Intercom Program Mix Input +
	Pin 5	Intercom Program Mix Input –

B4 - Audio 1 and Audio 2 Outputs
Male XLR5

	Pin 1	GND – Common for Audio Channel 1 and 2
	Pin 2	Audio Ch 1 Output +
	Pin 3	Audio Ch 1 Output –
XLR MALE 5M PLUG (solder side)	Pin 4	Audio Ch 2 Output +
	Pin 5	Audio Ch 2 Output –

B10 - Audio/Data Expansion Port
DB37 Female Connector

|	
Aud 1 Return In (+)	19
Aud 1 Return In (-)	37
GND	17
Aud 3 Out (+)	18
Aud 3 Out (-)	36
Aud 4 Out (+)	35
Aud 4 Out (-)	16
GND	34
Aud 2 Return In (+)	15
Aud 2 Return In (-)	33
Aud 5 Return In (+)	14
Aud 5 Return In (-)	31
Aud 3 Return In (+)	32
Aud 3 Return In (-)	13
Aud 4 Return In (+)	12
Aud 4 Return In (-)	30
GND	11
Aud 5 Out (+)	29
Aud 5 Out (-)	10
DV Code 2 LTC In (+)	28
GPI2 Out A	9
GPI2 Out B	27
Data 2 Program	8
Data 2 Out (+)	26
Data 2 Out (-)	7
GND	25
Data 2 In (+)	6
Data 2 In (-)	24
+12VDC for Format	2
Data 4 Program	5
Data 4 Out (+)	23
Data 4 Out (-)	4
GND	22
Data 4 In (+)	3
Data 4 In (-)	21
Data 5 Out (RS232) - Miranda Control	20
Data 5 In (RS232) - Miranda Control	1

F. Accessories and Breakout Cables

F1. 37 Pin Camera Cable

CopperHead G2
DV400/500
37-Pin Expansion Port Breakout Cable
CHG2-DV5-37EXP1

DX2
DB9 Female
Data #4 & Data #5 (Miranda Control)

DX3
DB15 Female
Data #2, GPI 1&2 Out, GPI 2 In

DX1
DB37 Male Plug

DX4
XLR3 Male
AUDIO 4 RET OUT

DX5
XLR3 Male
AUDIO 3 RET OUT

DX6
XLR3 Male
AUDIO 2 RET OUT

DX7
XLR3 Female
AUDIO 4 In

DX8
XLR3 Female
AUDIO 3 In

DX9
BNC Plug
Return Video 2
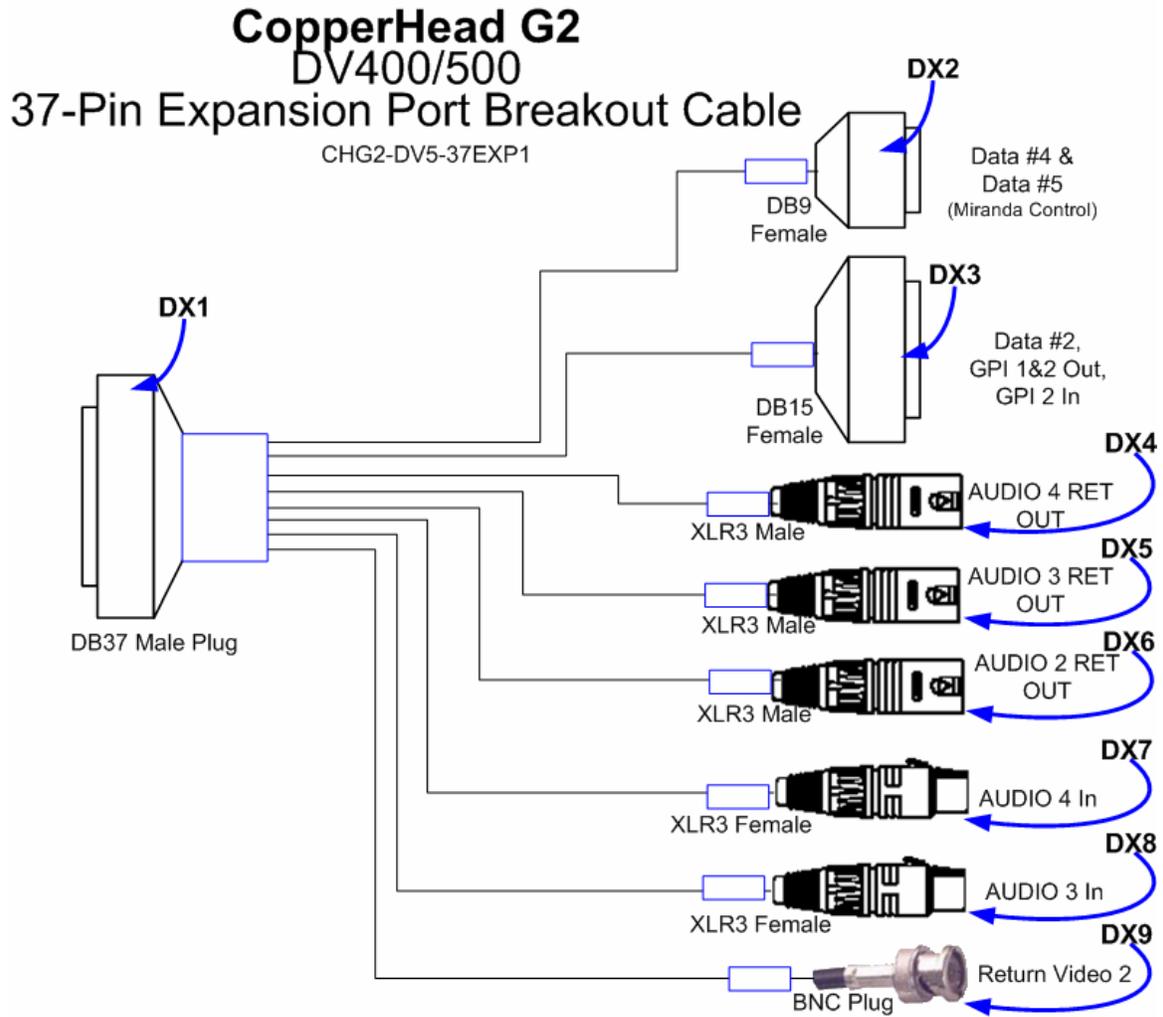
F2. 15-Pin Camera Cable
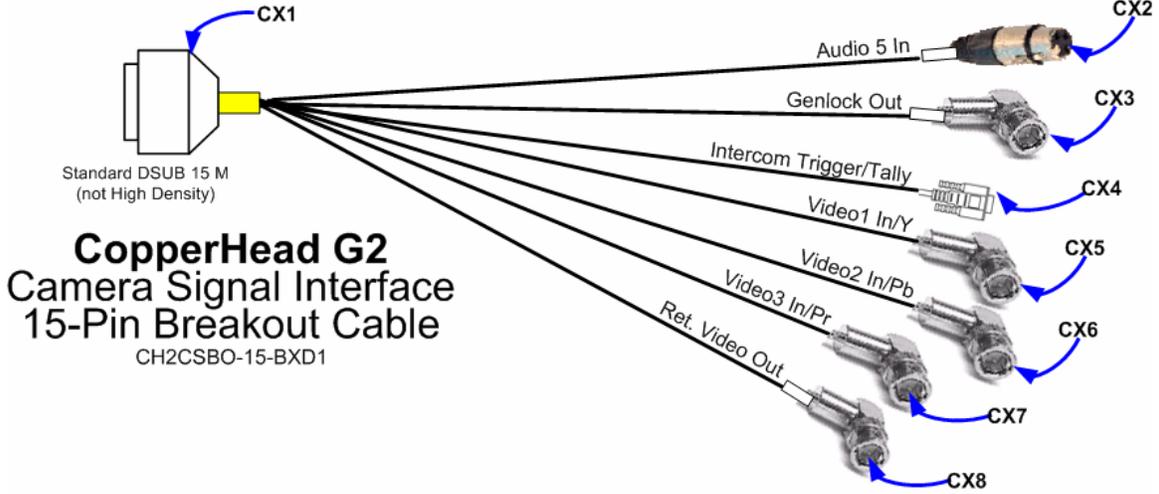
F3. 37 Pin Base Station Cable
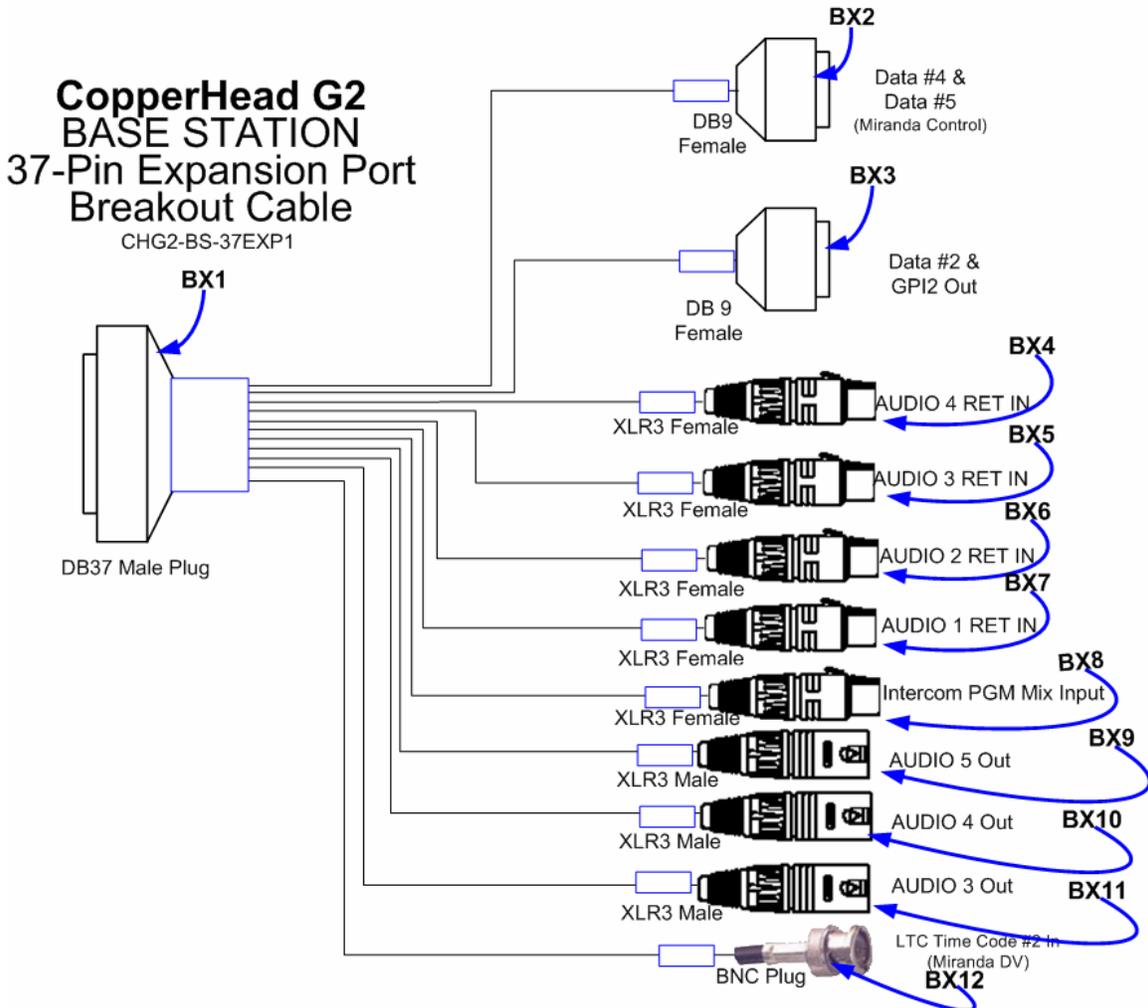
F4. Base Station Expansion Panel
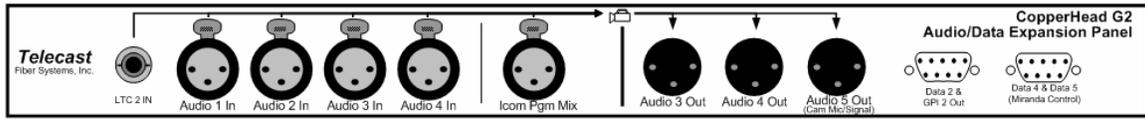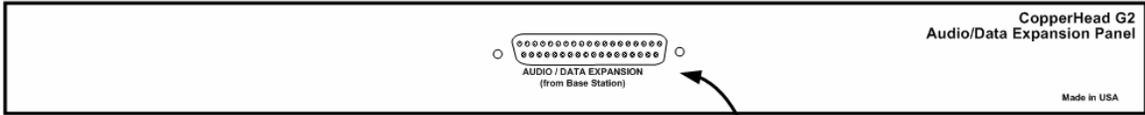
Note: This is a
Male receptacle

G. Specifications

Preliminary Specs:

<u>Digital Video</u>
Interface: SMPTE 259M, 292M
Data Rate: 19.4Mb/s to 1.5Gb/s
Input Impedance: 75 Ω
Output Impedance: 75 Ω
Jitter (pathological data pattern): <0.2UI
<u>Analog Video</u>
Interface: RS170, NTSC, PAL
Signal to Noise Ratio: >72 dB
<u>Audio</u>
Input/Output Impedance: 10kΩ/30kΩ
Frequency Resp: ±0.2db, 20Hz to 20kHz
Signal to Noise Ratio: >90dB
Total Harmonic Distortion: <0.1%
<u>Environmental</u>
Power (Consumption), CA: Max 11w @ 10-18VDC
Power (Consumption), BS: 10w @ 10-18VDC
Weight (CA/BS): 1.8 lbs/5 lbs
<u>Electro-Optical</u>
Operating Wavelengths: 1300nm/1550nm
TX Output Level (std/opt): -6 dbm/0 dBm
Receiver Sensitivity (HD/SDI): -22 dBm
Fiber Compatibility:
DV400: Single or Multimode
DV-500: Single Mode only
Distance Standard Laser: (Single/Multi) 5km/2km
Distance w/DFB Laser (Single Mode only): 20km