



INSTRUCTION MANUAL

SilverBack II

CAMERA-BACK FIBER OPTIC TRANSCEIVER

191 FOREST AVENUE
LOCUST VALLEY, NY 11560-2132 USA
(800)-488-8378 / (516)-671-7278 FAX (516)-671-3362
sales@multidyne.com
www.multidyne.com

MULTIDYNE, the Multidyne logo, X-X-FTX and X-X-FRX are registered trademarks of
MULTIDYNE Electronics, Inc.

Copyright 2009 MULTIDYNE Electronics, Inc., Locust Valley, New York. Printed in the United
States of America. All Rights Reserved. Contents of this publication may not be reproduced
in any form without the written permission of MULTIDYNE Electronics, Inc.

This product was designed and manufactured in the
UNITED STATES of AMERICA

TABLE OF CONTENTS

INTRODUCTION	1
FEATURES AND OPERATION.....	2
CAMERA UNIT	3
CAMERA VIDEO	4
RETURN VIDEO	4
REFERENCE	4
AUDIO	5
INTERCOM	6
DATA.....	6
TALLY AND GPIO	7
BASE UNIT	8
CAMERA VIDEO	8
RETURN VIDEO	9
REFERENCE	9
AUDIO	9
INTERCOM	10
DATA.....	10
TALLY AND GPIO	11
TIMECODE	11
FIBER INPUT/OUTPUT.....	12
POWER REQUIREMENTS	13
JUICE POWER OPTION	14
INSTALLATION.....	16
CAMERA UNIT	16
GOLD MOUNT	16
V-MOUNT.....	17
IRIS ROD MOUNT.....	18
BASE UNIT	20
APPENDIX A. PIN-OUT SPECIFICATION.....	21
CAMERA UNIT PIN-OUTS	21
BASE UNIT PIN-OUTS	22
APPENDIX B. BLOCK DIAGRAMS.....	24
SILVERBACK II CAMERA SIDE BLOCK DIAGRAM (TRANSMITTER)	24
SILVERBACK II BASE UNIT BLOCK DIAGRAM.....	25
APPENDIX C. TECHNICAL SPECIFICATIONS.....	26

INTRODUCTION

The new SilverBack II provides users with an ergonomic and unobtrusive package, optimized to deliver high-quality signals over long distances. This includes a full complement of bi-directional signals for most of the well-known digital camcorder brands in the market today.

The feature-rich, battery-powered system is truly an innovation for fiber transport. The SilverBack II transports all camera signals including SDI video, audio, control data, GPIOs, and tally for sports, ENG, D-SNG, and multi-camera studio applications over a single cable, over any distance.

The product design has been refined to keep overall size and weight as small as possible without sacrificing performance or operability. The elegant, compact case just over one-inch thick combines with a simple and intuitive user interface is for ease of use.



Figure 1 - SilverBack II Camera-Back Fiber Optic Transceiver

With a collaborative effort, MultiDyne now provides camera operators with innovative new solutions that are elegant in design while offering improved workflow and operational ease of use.

The design of new high-performance, fiber-optic based camera accessories are to target a wide range of applications — from broadcast television stations to 3D cinematographers.

The SilverBack II can also transport SDI video up to 3G HD-SDI uncompressed with embedded or separate program audio. The return video option supports up to 3G HD-SDI video for viewfinder or monitor viewing, providing a high-quality viewing experience for users in the field.

In addition, this system allows users to achieve camera control/RCP paint functions through one of the two available data channels, and an additional return video channel is available for camera sync or genlock. Several options are available for optical connectivity including STs, Neutrik® opticalCon, Fibreco Mini 2 expanded beam, and LEMO 304M.

FEATURES and OPERATION

Milled from a solid block of aluminum, the SilverBack-II measures just over 1-inch thick, and providing camera operators with a compact, unobtrusive camera-backed system for remote signal transmission.

MultiDyne includes integrated dovetails on the top and bottom of the unit that you can use with optional accessories, such as 15-mm iris rod adapters. This innovative feature is extremely useful for the next generation of small-sized cameras that do not have professional battery mounts or a method for shoulder use.

Refer [APPENDIX A](#) for Pin-Out details.

The following list shows SilverBack II features:

- All signals on ONE Cable
- Bi-Directional 3G-SDI
- 10km Operation
- Intercom with IFB/PGM inject
- Optional SDI Send for dual stream/3D
- 2 MIC inputs with phantom and pre-amps
- Accepts Anton-Bauer and “V-mount” Battery plates
- Integrated Tally lamps
- Camera RCP Control
- 1 additional Data path (232/422)
- 2 GPIO's
- Integrated swivel for optical connector
- Top-mounted taps for mounting viewfinder
- Optional 15mm Iris Rod bracket for mounting flexibility
- Lightweight, low-profile packaging

CAMERA UNIT

In the SilverBack II system, the operator control panel provides a simple interface by which the camera operator can quickly and easily check on system link, signal status, and adjust audio and intercom levels.



Figure 2 - SilverBack II Camera Unit

Soft-touch buttons and blue LED backlighting make these adjustments fast and easy.

CAMERA VIDEO

This section describes the details specific to SilverBack II camera video.



Figure 3 - Camera Video Connectors and Status

Video from the camera is connected to BNC input 1, which is at the top of the unit. The camera unit accepts all standard SMPTE video rates ranging from 19 Mbps to 3Gbps and supports embedded audio. LED's on the front panel indicate the video data rate.

BNC 2 provides a loop-thru output of the camera video. You can use this for local monitoring purposes.

RETURN VIDEO

This section describes the details specific to SilverBack II return video. You can use this feature for viewfinder, prompter, and so on.

Video from the base unit is transported to the camera unit and output on BNC 3. All standard SMPTE video rates ranging from 19 Mbps to 3 Gbps are supported as well as embedded audio. LEDs on the front panel indicate the video data rate.

REFERENCE

SilverBack II has a reference sync output for genlocking a camera and supports Black Burst and Tri-Level sync signals. It is highly recommended that you use Tri-Level sync for HD video and Black Burst for SD video. Reference video is output on BNC 5 (bottom most).

AUDIO

This section describes the details specific to SilverBack II audio.

There are two balanced MIC preamp channels available for microphones or other sources that are associated with the camera.

Each MIC preamp channel features adjustable gain from 0 to 60 dB in 10 dB increments. In addition, each MIC input has selectable 48V phantom power.

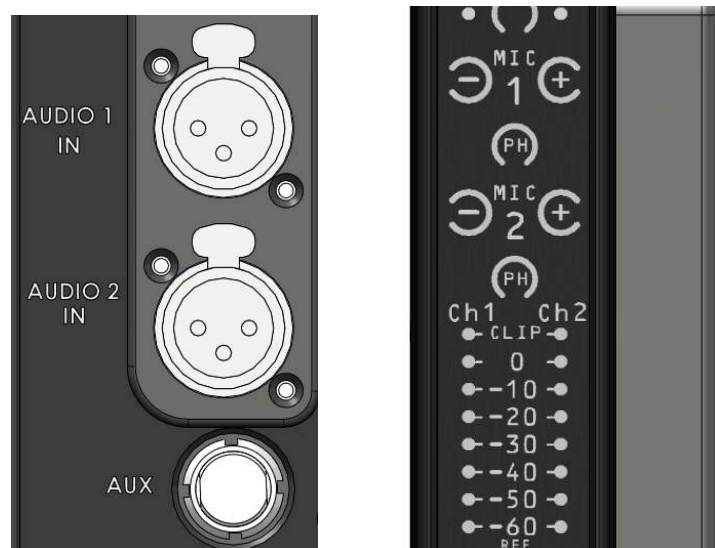


Figure 4 - MIC/Audio Inputs and Controls

MIC 1 and 2 + - buttons on the front panel are used to make adjustments to the gain. LED indicators will display the main microphone VU level or gain selection when gain modified. To turn the Phantom Voltage ON or OFF for a particular input, press and hold the desired PH button for approximately 1 sec.

Refer [APPENDIX A](#) for Pin-Out details.

INTERCOM

SilverBack II supports an intercom headset port with headphone mixer for program audio, intercom audio. Intercom audio is output on the left headphone channel and program audio is on the right channel. You can perform MIC gain and sidetone adjustments using recessed trimpots at the bottom of the front panel. The headset uses a 5-pin XLR connector.



Figure 5 - Headset Connector and Controls

A Local/Remote button on the front panel allows selection between the PTT switch on the panel or a remote switch that can be used to open the intercom MIC. The selected switch's LED blinks when the MIC is open.

In addition, SilverBack II has a headphone amplifier for a talent earphone. This amplifier has an adjustable level through the front panel. The audio for this originates from the PGM Audio input at base.

DATA

SilverBack II supports two bi-directional serial data communication channels each with its own 7 pin LEMO connector. You can select RS232 or RS422 by either wiring Pin 4 to GND or wiring it footing respectively. LED's on the front panel indicate data activity for DATA channels 1 and 2.



Figure 6 – Data Connectors

Refer [APPENDIX A](#) for Pin-Out details.

TALLY AND GPIO

SilverBack II has two integrated Tally LED's to indicate Tally status, a large bar at the rear of the unit as well as on the front panel. In addition, a relay contact Tally output provided on the 16-pin LEMO connector labeled AUX.

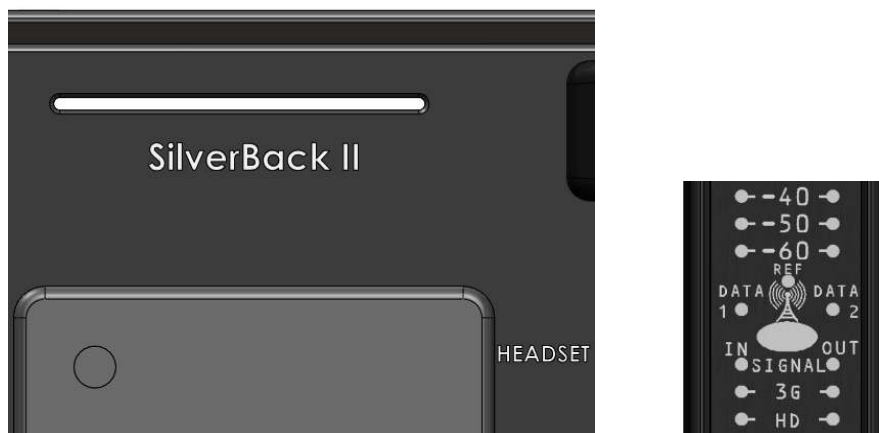


Figure 7 - Tally

The AUX connector also provides two GPI's and two GPO's for user-defined purposes, as well as Timecode input and output.

In addition, the AUX connector has an input to key the headset MIC. A closure to ground activates this input.



Figure 8 – AUX Connector

Refer [APPENDIX A](#) for Pin-Out details.

BASE UNIT

The SilverBack-II Base Unit is a one RU rackmount chassis that provides all the audio, video and data I/O's to and from the Camera Unit.

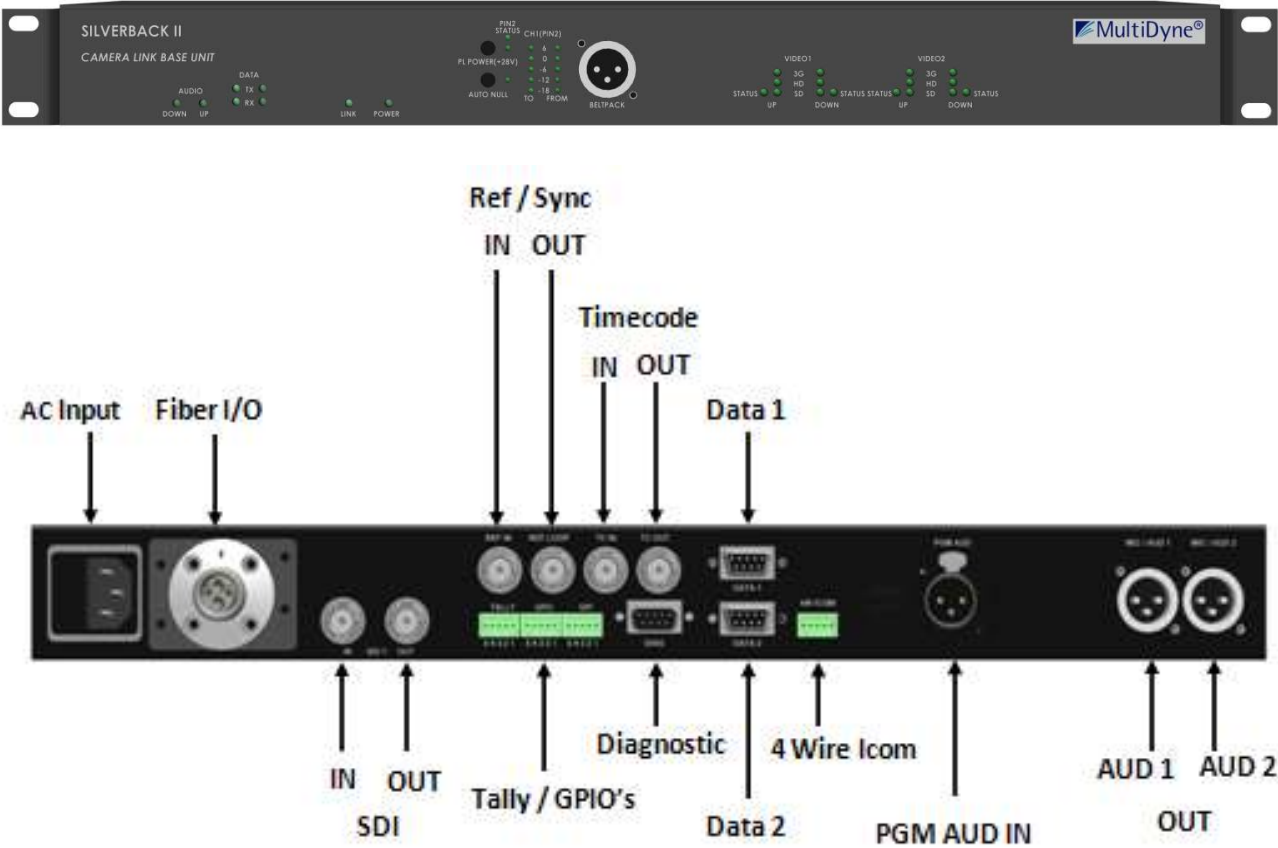


Figure 9 – SilverBack II Base Unit

Refer [APPENDIX A](#) for Pin-Out details.

CAMERA VIDEO

The camera video output provides the SDI video output from the camera and supports all SMPTE video rates up to 3Gbps including any embedded audio or data from the camera.



Figure 10 - Camera Video

RETURN VIDEO

You can use this input to provide an SDI video signal back to the camera unit. Primarily, you can use this with a viewfinder, prompter, and so on. The return video supports all SMPTE video rates up to 3GBps as well as embedded audio.

REFERENCE

You can use the reference input to provide a reference signal to the camera for genlocking purposes. SilverBack II supports Black Burst and Tri-Level sync signals. A Loop-Through output is provided for connecting to additional equipment.

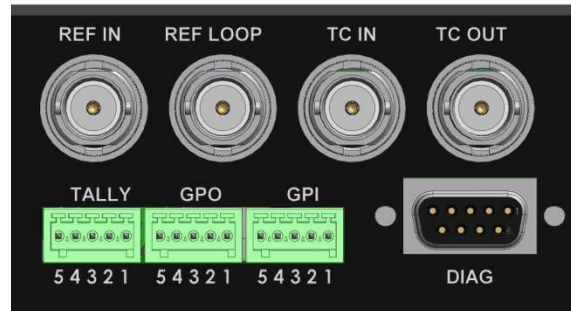


Figure 11 - Reference Input

Note: It is highly recommended that you use Tri-Level sync for HD video and Black Burst for SD video.

AUDIO

This section describes MIC/Line audio 1 and 2 outputs.

These XLR connectors provide the analog outputs from the corresponding inputs at the camera unit. MIC/Line selection, as well as audio gain is set at the camera unit. You can set the full scale (FS) output level from 0 dBu to a maximum of +24 dBu.



Figure 12 - MIC/Line Audio 1 and 2 Outputs

Refer [APPENDIX A](#) for Pin-Out details.

INTERCOM

SilverBack II supports a 4-wire intercom connection to the camera unit. With the help of an additional mono audio input, you can either send PGM audio back to the camera or use as a Talent IFB channel.



Figure 13 - Intercom Connection

The nominal audio input level for 4-wire intercom and PGM/Talent IFB is +4 dBu (+24 - dBu max). MultiDyne provides audio level adjustments for these signals on the camera unit.

Refer [APPENDIX A](#) for Pin-Out details.

DATA

The SilverBack-II supports two bi-directional data channels from the base to the camera. These channels are configurable for RCP/Paint control or other data communication purposes as follows:

- RS232
- RS422
- TTL data levels

The custom RCP/Camera cable sets are available from MultiDyne for most mainstream camera manufacturers. You can observe the data communication activity for each channel through the front-panel LED's.



Figure 14 - Two Bi-Directional Data Channels

Refer [APPENDIX A](#) for Pin-Out details.

TALLY AND GPIO

SilverBack II includes a dedicated Tally input to provide Tally indication at the Camera, typically from a production switcher or Tally System. Connecting this input pin to Ground activates the Tally Lamp and Tally output on the Camera Unit.

SilverBack II provides two additional GPI inputs for user-defined purposes and two GPO outputs for user GPI signals initiated at the Camera Unit. These N/O relay contacts are closed to ground when the GPI is activated. They are capable of handling 48V, and 1A.

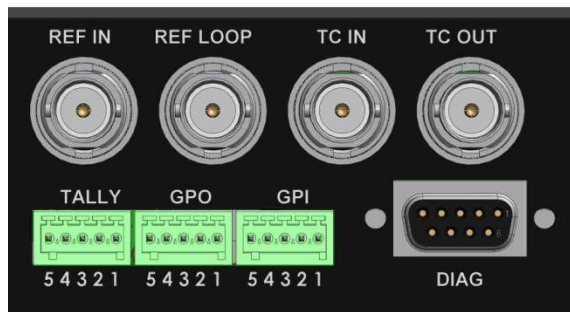


Figure 15 - Tally and GPIO

Refer [APPENDIX A](#) for Pin-Out details.

TIMECODE

SilverBack-II includes a timecode input to provide to the camera. The timecode input is unbalanced and handles levels up to 7Vp-p.

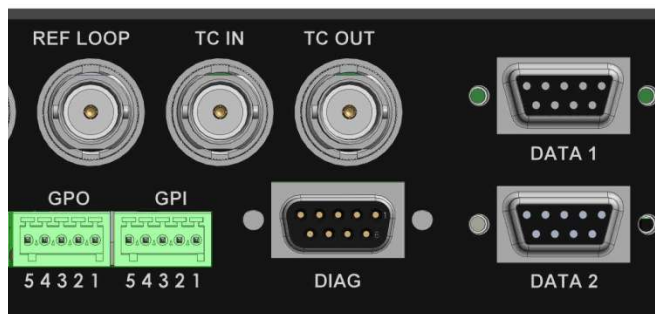


Figure 16 - Timecode Input and Output

In addition, a timecode output is included to provide the timecode output from the camera to other devices. The timecode output is unbalanced, 3Vp-p.

FIBER INPUT/OUTPUT

The SilverBack II transports all bi-directional signals using CWDM technology on a single fiber. For this, a single-mode fiber is required.



Figure 17 - SMPTE 304M

In SilverBack II, the fiber optic connection is made at the rear of the base unit. Several different connector types are available that includes, SMPTE 304M (as shown above), Neutrik opticalCon Duo, Expanded Beam, ST, and LC.

POWER REQUIREMENTS

The SilverBack-II mounts between a professional broadcast camera and its battery with your choice of Anton-Bauer or “V-Mount” battery plates. Being only 1” thin and 2.5 pounds in weight, the SilverBack-II will not significantly alter the total weight or the center-of-gravity of the handheld camera. With SilverBack II’s energy-efficient design, power consumption is minimal, as well.

If local power is available, you can use a local 12VDC supply with a 4-pin adapter plate (Anton-Bauer part # SO-XLR) to power both the SilverBack II and the camera.

JUICE POWER OPTION

You can power the Silverback II Camera Unit and Camera by the optional Juice Back power system, and eliminate the need for a battery or local power supply. The Juice Back receives its power from the SilverBack Base Unit using a hybrid fiber cable.

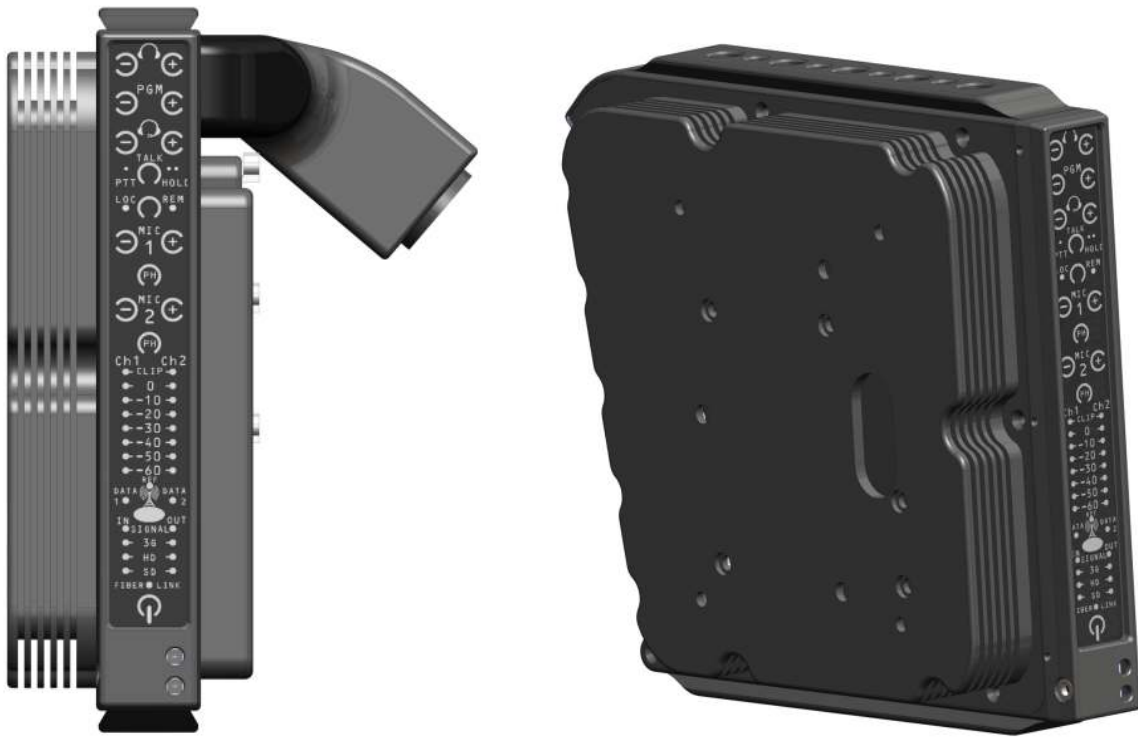


Figure 18 - SB Cam with Juice Front and Oblique View

The Juice Back option is installed as an integral part of the SilverBack II Camera Unit, replacing the standard rear cover plate. There are no additional external power cables to connect and however, you may still use a battery in parallel.

The Juice Back power system can deliver up to 100W of power to the camera at distances up to 1000 feet. Camera configurations, accessories, and the length and type of used Hybrid fiber cable affect the amount of total power available at the camera.

You can use the following chart as a guideline to determine whether a particular power and distance requirement can meet with the Juice Back system. The trend line in the chart indicates Gepco HDC 120P hybrid fiber cable.

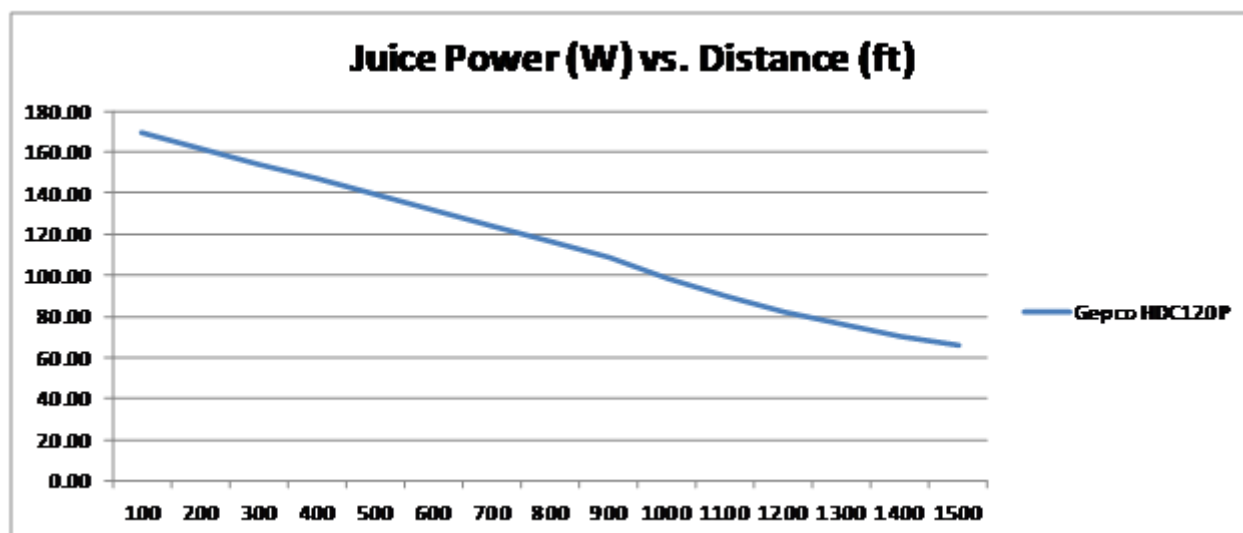


Figure 19 – Juice Power

The HUT-48, an external remote power supply option is also available that allows power to be injected mid-span, rather than being supplied from the SilverBack Base Unit. This allows greater flexibility in covering longer distance or higher power requirements. For instance, you can run one km of standard ST fiber cable from the Base Unit to the HUT-48, which then provides power to the camera for the last 150m on hybrid fiber cable.

INSTALLATION

This section describes SilverBack II Camera and Base Unit installation.

MultiDyne supports the following installation types:

- Gold Mount
- V-Mount
- Iris Rod Mount

Gold Mount and V-Mount are different types of camera battery form factors for professional video cameras. You can mount the SilverBack II camera unit directly on the back of a professional video camera that has either of these two battery styles.

CAMERA UNIT

This section describes the various installation/mounting systems from the camera unit perspective. The SilverBack II camera unit includes both the Male and Female battery mount plates. When you mount cameras with either Gold Mount or V-Mount systems, the camera unit mounts between camera and battery. The camera unit shares power from the battery with the camera.

GOLD MOUNT

Gold Mounts are one type of camera battery form factor for professional video cameras.

Gold Mount locks into place to provide uninterrupted power to your camera by employing three solid mechanical connections and self-cleaning, gold-plated communication pins.



Figure 20 - Gold Mount Sample

Providing power requirements ranging from 7.2V to 28V, the Gold Mount System is the most widely used battery mounting system by professionals in the industry. It is available as factory standard equipment on many cameras from leading manufacturers.

V-MOUNT

V-Mounts are another type of camera battery form factor for professional video cameras. They are versatile, affordable, and easy to use.



Figure 21 - V-Mount Samples

In this type, configurations with peripheral equipment, such as camera lights and hard disk recorders are common and you can power by industry standard D-tap connectors on V-Mount plates.

IRIS ROD MOUNT

For camera systems without Gold or V-Mounts, or in situations, where SilverBack II cannot be directly mounted to a camera, a dovetail accessory is available. This allows you to mount the camera unit to a set of 15mm Iris Rods.



Figure 22 - Iris Rod Mounting Camera Sample-1



Figure 23 - Iris Rod Mounting Camera Sample-2

BASE UNIT

The SilverBack II base unit mounts directly in a standard 19-inch equipment rack and is 1 RU (1.75-inch) in height.

The base unit includes a universal input power supply that ranges from 85 and 264 VAC, and a detachable IEC320 power cord.

APPENDIX A. Pin-Out specification

CAMERA UNIT PIN-OUTS

Pin #	Function	
Operator Headset (XLR-5-F)		
1	MIC L	
2	MIC H	
3	GND	
4	Left Ear	
5	Right Ear	
Audio 1 & 2 IN (XLR-3-F)		
1	GND	
2	Audio In +	
3	Audio In -	
Data 1 & 2 (LEMO ECG.0B.307.CLN)		
	R232	RS422
1	GND	GND
2	RXD In	RXD In -
3	-	TXD Out +
4	Tie to GND	Leave Floating
5	-	RXD In +
6	TXD Out	TXD Out -
7	-	-
AUX Data / Audio (LEMO ECG.1B.316.CLN)		
1	GPI 1 In	
2	GPI 2 In	
3	GPI 1 Out	
4	GPO 2 Out	
5	Headset MIC PTT	
6	Tally Out	
7	Return Audio 1 Out +	
8	Return Audio 1 Out -	
9	Return Audio 2 Out +	
10	Return Audio 2 Out -	
11	LTC In	
12	+12VDC Out	
13	GND	
14	GND	
15	GND	
16	LTC Out	

Table 1 - Camera Unit Pin-Outs

BASE UNIT PIN-OUTS

Pin #	Function	
Tally (Riacon 31374105)		
1	GND	
2	Tally In	
3	GND	
4	N/C	
5	GND	
GPO (Riacon 31374105)		
1	GND	
2	GPO 1	
3	GPO 2	
4	N/C	
5	N/C	
GPI (Riacon 31374105)		
1	GND	
2	GPI 1	
3	GPI 2	
4	N/C	
5	N/C	
Data 1 & 2 (DB-9-F)		
	R232	RS422
1	-	-
2	TXD Out	TXD Out -
3	RXD In	RXD In -
4	Tie to GND	Leave Floating
5	GND	GND
6	-	-
7	-	TXD Out +
8	-	RXD In +
9	+12VDC Out	+12VDC Out
4-Wire Icom (Riacon 31374105)		
1	GND	
2	Audio In +	
3	Audio In -	
4	Audio Out +	
5	Audio Out -	
2-Wire Com (XLR-3-M)		
1	Return Audio 1 Out +	
2	Return Audio 1 Out -	
3	Return Audio 2 Out +	

Pin #	Function
PGM IN (XLR-3-F)	
1	GND
2	Audio In +
3	Audio In -
AUD 1,2 OUT (XLR-3-M)	
1	GND
2	Audio In +
3	Audio In -

Table 2 - Base Unit Pin-Outs

APPENDIX B. Block Diagrams

SILVERBACK II CAMERA SIDE BLOCK DIAGRAM (TRANSMITTER)

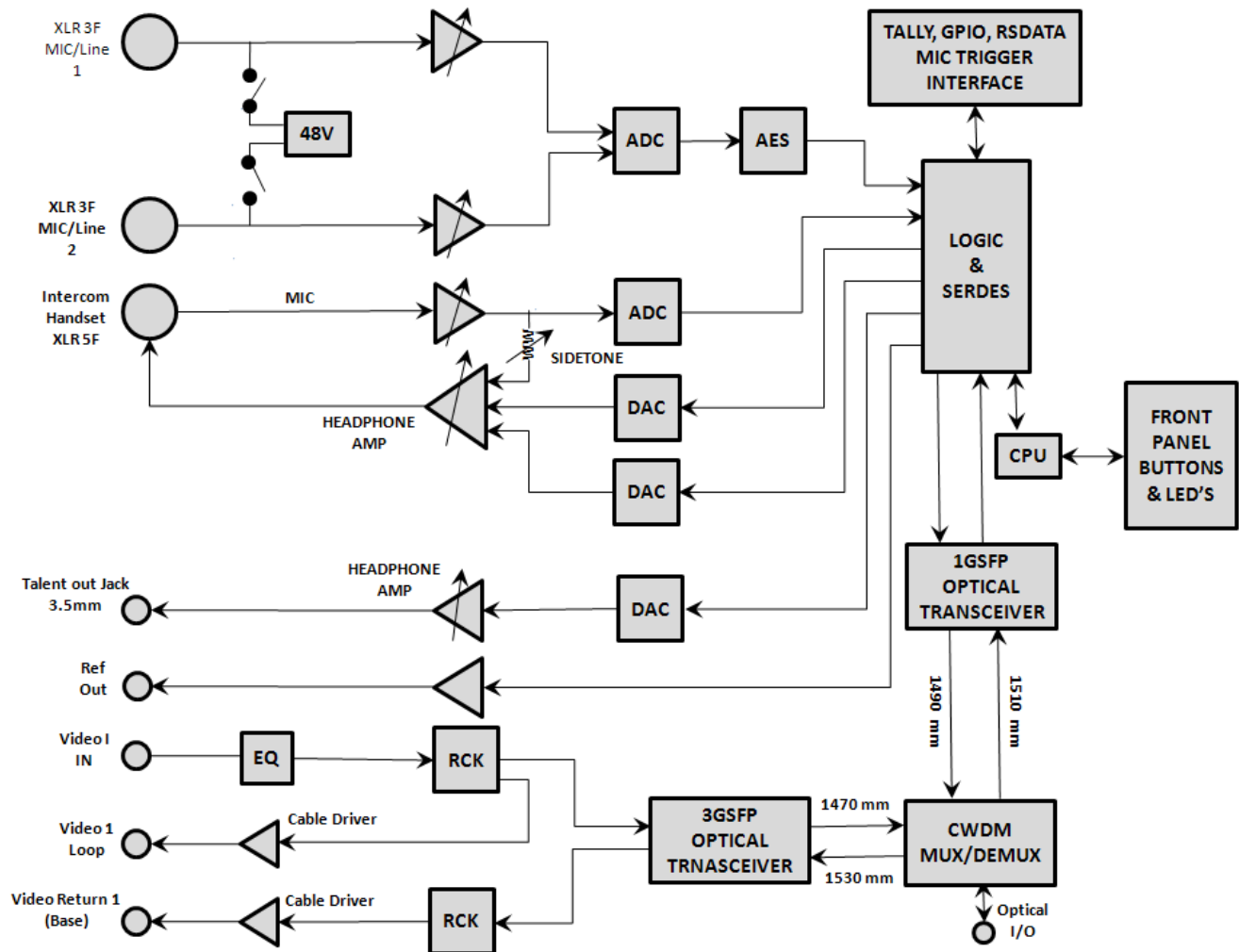


Figure 24 - SilverBack II Camera Side Block Diagram (Transmitter)

SILVERBACK II BASE UNIT BLOCK DIAGRAM

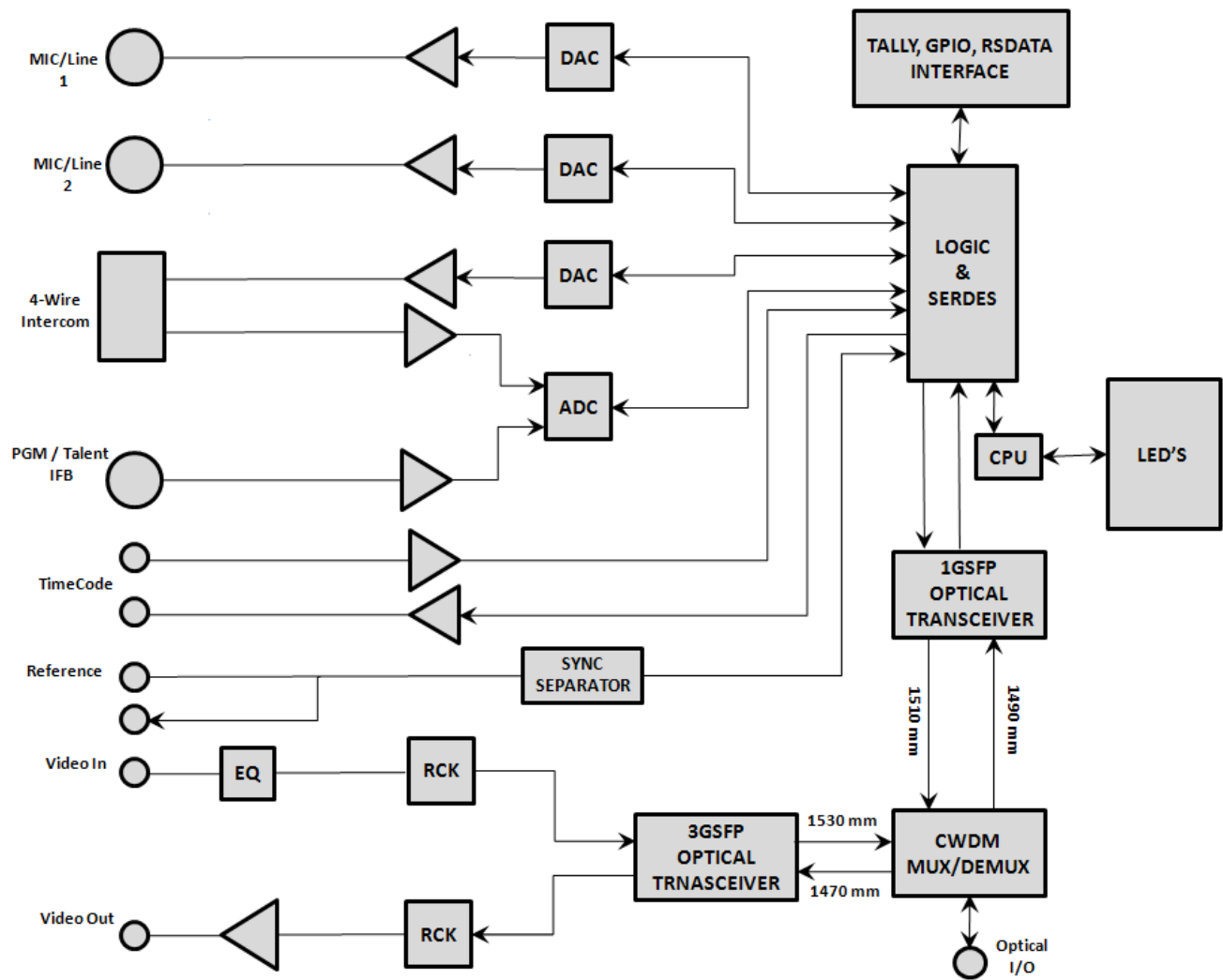


Figure 25 - SilverBack II Base Unit Block Diagram

APPENDIX C. Technical Specifications

CAMERA UNIT

Bi-Directional Digital Video

Format Support:SMPTE259M, 292M, 424M, 301M
Data Rate:19Mbps to 3Gbps
Impedance:75 Ohms
Signal Level:800mVp-p, nominal
Inputs (Camera to Base):1
Outputs (Base to Camera):1

Analog Audio

Inputs (Camera to Base):2
Type:MIC / Line, Balanced
Impedance:20k, 2k, 600 ohms, selectable
Signal Level:+4 dBu nominal, +24dBu max.
Frequency Response:±0.5dB, 20Hz to 20kHz
Gain:0 to 60 dB, selectable in 10 dB increments
MIC Phantom Power:+48V, selectable on/off

PGM Audio / Talent IFB Output

Number of Channels:1
Type:Unbalanced
Connector:3.5mm Stereo Jack
Controls:Volume

Intercom

Number of Channels:1
Compatibility:Clear-Com, RTS
Headset Connector:XLR-5 Female
MIC Type:Dynamic
MIC Impedance:200 Ohms, nominal
Controls:MIC Gain, Side-tone, PTT, Volume, PGM Mix

Data / Camera Control

Number of Channels:2, bi-directional
Format:RS232/RS422, TTL, selectable
Data Rate:Up to 1Mbps RS422, 115kbps RS232
Connector:LEMO 7-pin, 0B Series

Tally and GPIO

Number of Inputs:2
Logic "0" (Off):TTL Low or short to GND
Logic "1" (On):TTL High or +5V
Data Rate:Can support signals up to 1Mbps
Number of Outputs:2 + Tally
Output Type:Relay Contact, Form C, 30V 2A

Electro-Optical

Operating Wavelengths:1471-1531nm
Tx Laser Output Power:-2 to 0dBm, Class 1 Laser
Receiver Sensivity:-18dBm
Fiber Compatibility:Singlemode
Optical Connector Types:ST, OpticalCon DUO, SMPTE311

Mechanical / Environmental

Dimensions (LxWxH):.....7" x 7"x 1"
Weight:<3 lbs
Power Input:Gold Mount or V Mount Battery
Power Consumption:8 Watts
Environmental:.....0 to 50C, 0 to 95% RH, non-condensing

BASE UNIT

Bi-Directional Digital Video

Format Support:SMPTE259M, 292M, 424M, 301M
Data Rate:19Mbps to 3Gbps
Impedance:75 Ohms
Signal Level:800mVp-p, nominal
Inputs (Camera to Base):1
Outputs (Base to Camera):1

Analog Audio

Outputs (Camera to Base):.....2
Type:Balanced
Impedance:.....< 50 Ohms
Signal Level:+4 dBu nominal, +24dBu max.
Frequency Response:±0.5dB, 20Hz to 20kHz

PGM Audio / Talent IFB Output

Number of Channels:1
Type:Balanced
Impedance:20k, 2k, 600 Ohms, selectable
Signal Level:+4 dBu nominal, +24 dBu max.
Frequency Response:±0.5dB, 20Hz to 20kHz

Intercom

Number of Channels:1
Compatibility:Clear-Com, RTS
Type:4-Wire, Balanced
Input Impedance:20k Ohms
Signal Level:+4 dBu nominal, +24 dBu max.
Frequency Response:±0.5dB, 20Hz to 20kHz
Output Impedance:< 50 Ohms

Data / Camera Control

Number of Channels:2, bi-directional
Format:RS232/RS422, TTL, selectable
Data Rate:Up to 1Mbps RS422, 115kbps RS232
Connector:.....DB9-F

Tally and GPIO

Number of Inputs:.....2
Logic "0" (Off):TTL Low or short to GND
Logic "1" (On):TTL High or +5V
Data Rate:Can support signals up to 1Mbps
Number of Outputs:2 + Tally
Output Type:.....Relay Contact, Form C, 30V 2A

Electro-Optical

Operating Wavelengths:1471-1531nm
Tx Laser Output Power:-2 to 0dBm, Class 1 Laser
Receiver Sensivity:-18dBm
Fiber Compatibility:.....Singlemode
Optical Connector Types:ST, OpticalCon DUO, SMPTE311

Mechanical / Environmental

Dimensions (LxWxH):.....19" x 10.5"x 1.75"
Weight:4 lbs
Power Input:IEC320, Universal Input, 90-264VAC
Power Consumption:20 Watts
Environmental:.....0 to 50C, 0 to 95% RH, non-condensing

Specifications are subject to change without notice.