AIS Apogee IMAGING SYSTEMS

151 N. Sunrise Ave, Suite 902
Roseville CA 95661 USA
Tel 916-218-7450
Fax 916-218-7451
www.ccd.com

Camera Test Report

Camera Serial Number 101731
Part Number D02F-MG43D-U04240-MB1A
Camera Series Alta **Interface** U
Sensor e2v CCD42-40 **Sensor Grade** 1
Sensor Serial Number 10251-09-05
Sensor Size 2048 x 2048

Test Date 1/28/2011
Tested by L. Nguyen
Model 42
CCD Type Midband
Bits 16
Cooling 2 Stage

TEST DATA

Gain	1.2 (electrons per count)
Standard Deviation	7.13 (counts)
RMS Noise	8.7 (electrons)
Maximum Digitized Well Capacity	78K (electrons)
Bias level	1235 (counts)
120 Second Dark	1249 (counts; includes bias level)
Dark Current	0.14 (electrons per pixel per second)
Test Temperature	-22 (°C); **Delta** 47 (°C)

Firmware Version 33
MAC Address
DLL Version 3.8.10.1100
Shutter Type MG43
Finish: Back Nickel-plated
Finish: Front Blue Anodized

Configuration D02 **ConfigRev**
Drawing Rev PR3
Back Focal Distance (Physical) (inches)
Back Focal Distance (Optical) (inches)
Window D
Window Material Fused Silica w/MgF2

Notes

CAMERA CERTIFICATE OF COMPLIANCE

Camera Model	Traveler Number	CCD Serial number
442	101731	10251-09-05

Procedure	Description	Quality (pass/fail)	Initials
MPI-ALTA-01	Assembly Procedures.	Pass	RA
MPI-ALTA-02			
MPI-ALTA-03			
MPI-ALTA-04.1			
MPI-ALTA-05			
MPI-ALTA-07	Integrity Testing Procedures.	Pass	RA
MPI-ALTA-08			
MPI-ALTA-09	Electronic Integration Procedure.	Pass	RT
MPI-ALTA-10			
MPI-ALTA-11.1			
MPI-ALTA-12			
MPI-ALTA-13	Final Testing Procedures.	PASS	RT
MPI-ALTA-14	Shipping Inspection	Pass	Shipper

Notes:

Ocean Optics

Wavelength Calibration Data

Built For:	**University of California San Diego**
Order Number:	**605354**
Model:	**QE65000**
Description:	Scientific-grade Spectrometer
Grating:	300 Line Composite Blaze
Bandwidth:	200 - 925 nm
Options Installed:	S7011 Detector, 200nm OFLV Filter, 25um Slit
Serial Number:	**QEB0363** **Master**

λ	Pixel #	Predicted λ	Δλ
253.652	68	253.779	-0.127
296.728	122	296.487	0.241
302.150	129	302.011	0.139
313.155	143	313.051	0.104
334.148	170	334.311	-0.163
365.015	209	364.944	0.071
404.656	260	404.863	-0.207
407.781	264	407.987	-0.206
435.835	300	436.057	-0.222
546.074	442	545.928	0.146
576.959	482	576.620	0.339
579.065	485	578.917	0.148
696.543	640	696.659	-0.116
706.722	653	706.447	0.275
727.294	681	727.481	-0.187
738.398	696	738.721	-0.323
750.387	712	750.691	-0.304
763.510	729	763.384	0.126
772.421	741	772.328	0.093
794.817	771	794.635	0.182
801.479	780	801.312	0.167
811.531	794	811.683	-0.152
826.452	814	826.468	-0.016
840.821	833	840.481	0.340
842.465	836	842.690	-0.225
852.144	849	852.255	-0.111
866.794	869	866.939	-0.145
912.297	931	912.220	0.077
922.450	945	922.394	0.056
965.778	1005	965.777	0.001

Calibration Coefficients

First Coefficient:	0.795904051
Second Coefficient:	-2.51785E-05
Third Coefficient:	-8.32629E-09
Intercept:	199.776334
Regression Fit:	0.999999631

Stray Light Measurements (AU)

Holmium Oxide (444nm):	1.16
Yellow Dye:	1.99
Blue Dye:	3.03
Molybdate:	1.54
OG550 Filter:	2.19
RG850 Filter:	3.43
FG3 Filter:	1.15

11/18/08 Carlos Velazco

Linearity Test

Serial Number **QEB0363**

Tech: Beverly.Dulac

Linearity: **99.96282**

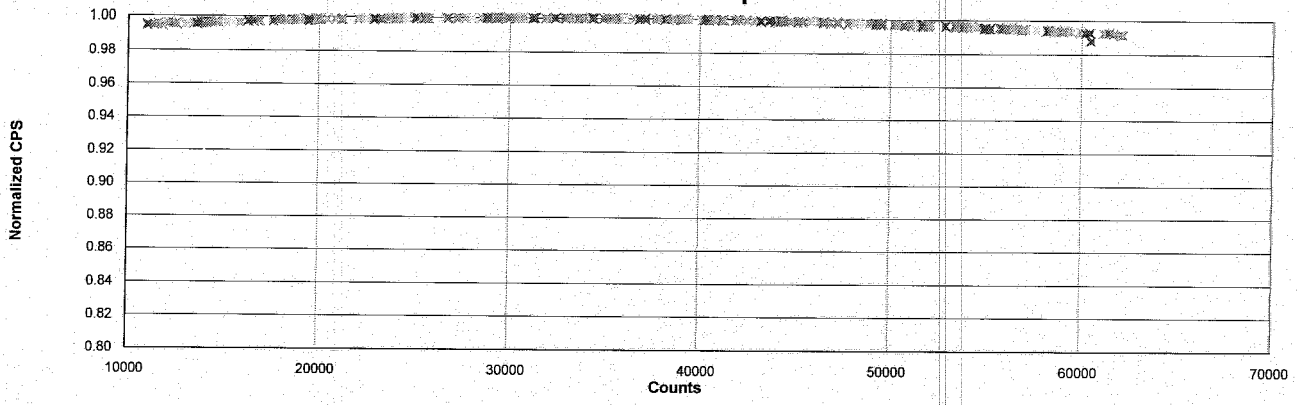
Tested: 11/17/08

Test # 9,767.00

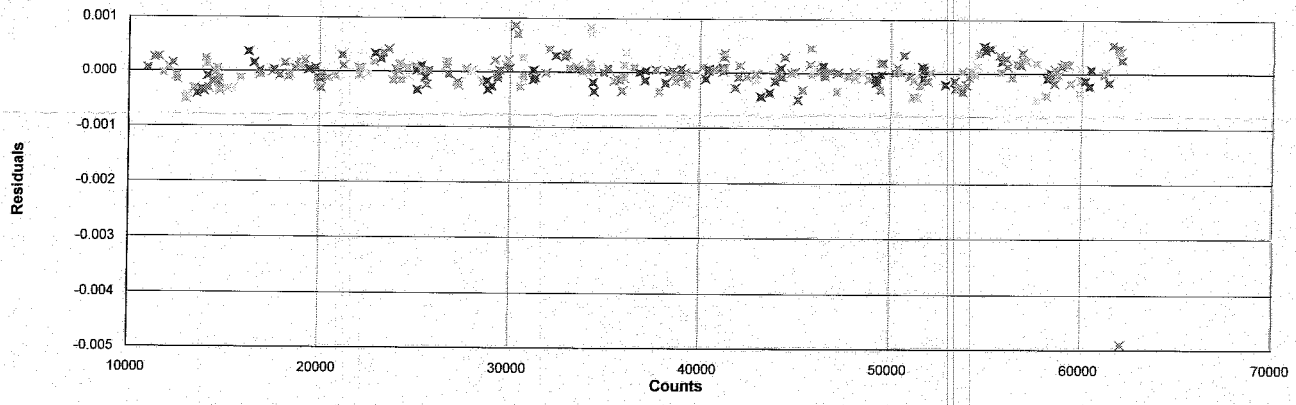
Intercept	0.992895
Coefficient 1	-5.06051e-007
Coefficient 2	1.25542e-010
Coefficient 3	-7.85509e-015
Coefficient 4	2.5036e-019
Coefficient 5	-4.47553e-024
Coefficient 6	4.23053e-029
Coefficient 7	-1.65245e-034

Ocean Optics

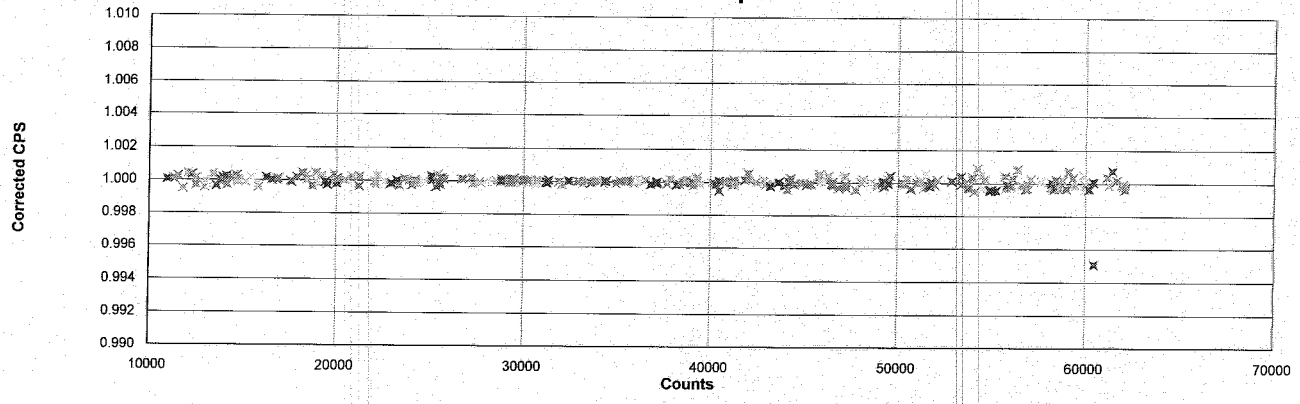
Normalized Output



Residuals



Linearized Output



Max **1.00086761**

Min **0.99505913**

Ocean Optics Inc.
First in Photonics™

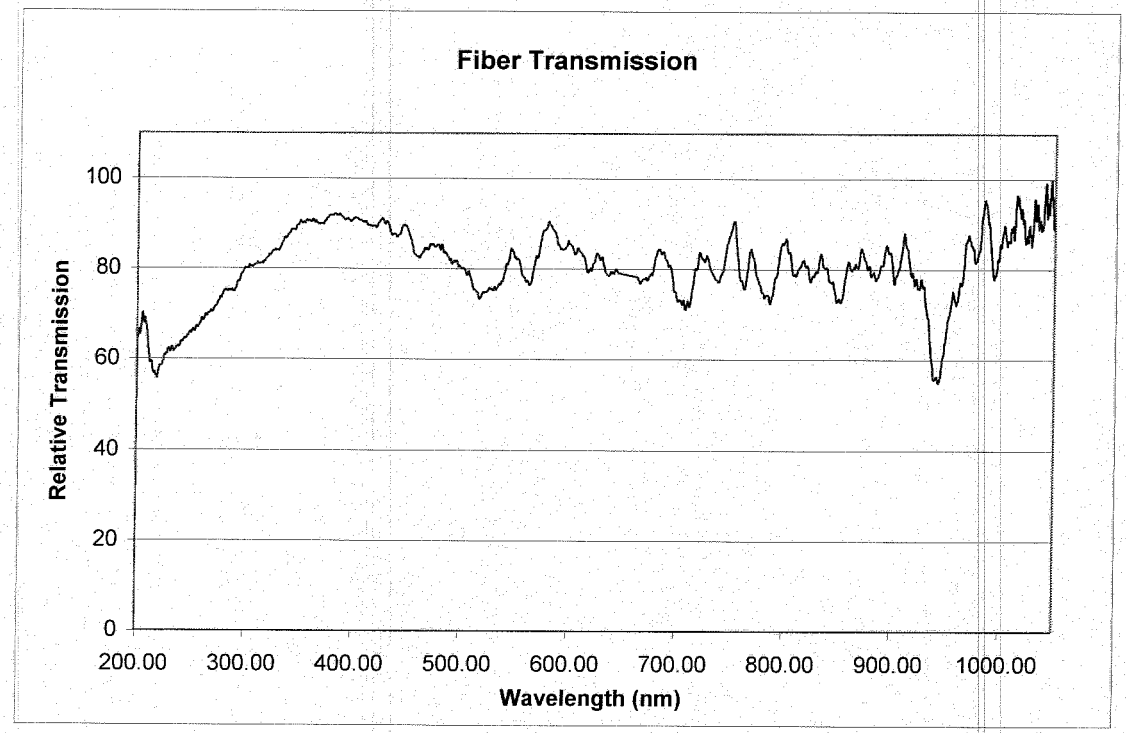
Fiber Assembly Report

Part #:	QP50-2-UV-VIS
Date:	**November 3, 2008**
Assembly #:	EOS-41602-1
Connector 1 #:	QSMA
Connector 2 #:	QSMA
Sales Order #	STOCK

www.OceanOptics.com
Phone:727-733-2447
Fax:727-733-3962
Info@OceanOptics.com
830 Douglas Ave
Dunedin, FL 34698

Ask about our custom line of Optical Probes and Assemblies.

Fiber Type:	UV-VIS	**Jacketing:**	Monocoil
Fiber Core Diameter:(um)	50um	**Length (meters):**	2.00



Ocean Optics Inc.
S/N
P/N: QP50-2-UV-VIS
EOS-41602-1
SO# STOCK

Inspection Checklist X
Polish: X
Concentricity: X
Cap Placement: X
Labeling: X
Color Coding: X
Ferrule length: X

Inspected by: Van Foster
Van Foster

RoHS - Compliant

Ocean Optics Inc.
First in Photonics™

Wavelength Calibration Data Sheet

Built For:	**University of California - San Diego**
Order Number:	**34432**
Model:	**USB2000**
Description:	USB Fiber Optic Spectrometer
Grating:	1200 Lines Blazed at 750 nm
Bandwidth:	700 - 960 nm
Options Installed:	10um Slit
Serial Number:	**USB2E4013** **Master**

λ	Pixel #	Predicted λ	Δλ
706.722	64	706.726	-0.004
727.294	197	727.309	-0.015
738.398	270	738.397	0.001
750.387	350	750.379	0.008
763.510	439	763.499	0.011
772.421	500	772.363	0.058
794.817	658	794.835	-0.018
801.479	706	801.522	-0.043
811.531	779	811.567	-0.036
826.452	889	826.417	0.035
842.465	1011	842.481	-0.016
852.144	1086	852.145	-0.001
866.794	1202	866.772	0.022
912.297	1585	912.284	0.013
922.450	1676	922.465	-0.015

Calibration Coefficients

First Coefficient:	0.15835165
Second Coefficient:	-1.37399E-05
Third Coefficient:	-2.09407E-10
Intercept:	696.6481905
Regression Fit:	0.999999918

Stray Light Measurements (AU)

Holmium Oxide (444nm):	N/A
Yellow Dye:	N/A
Blue Dye:	N/A
Molybdate:	N/A
OG550 Filter:	N/A
RG850 Filter:	3.81
FG3 Filter:	N/A

07/29/02 Kathy Cheeseman

INVOICE

TRON-TECH

63 SHARK RIVER ROAD • NEPTUNE, NEW JERSEY 07753 • (201) 922-8585

NO. 98239

DATE MAY 17, 1989

SOLD TO:

AT&T LABORATORIES
ACCOUNTS PAYABLE
P O BOX 800
SHORT HILLS NJ 07078

SHIP TO:

AT&T LABS
600 MOUNTAIN AVE
SHORT HILLS NJ 07974

ACCOUNT NO.	CUST. ORDER NO.	SHIP. INSTR.	REPRESENT.	BUYER	TERMS: F.O.B. NEPTUNE
101	AP-14 260031	UPS	METRO MICS	P WRABACK	NET 30

ITEM	QUANTITY ORDERED	QUANTITY SHIPPED	ORDER BALANCE	DESCRIPTION	UNIT PRICE	TOTAL VALUE
1	1	1	-0-	AMPLIFIER MODEL # W20ATC S/N # A92001	350.00	350.00
2				C OF C ENCLOSED	N/C	
3				DATA SHEET ENCLOSED	N/C	
				SHIPPING		1.47
				TOTAL		351.47

SPECIAL INSTRUCTIONS

TRONTECH, INC.
63 SHARK RIVER ROAD
NEPTUNE, NEW JERSEY 07753

CUSTOMER AT&T BELL LABS

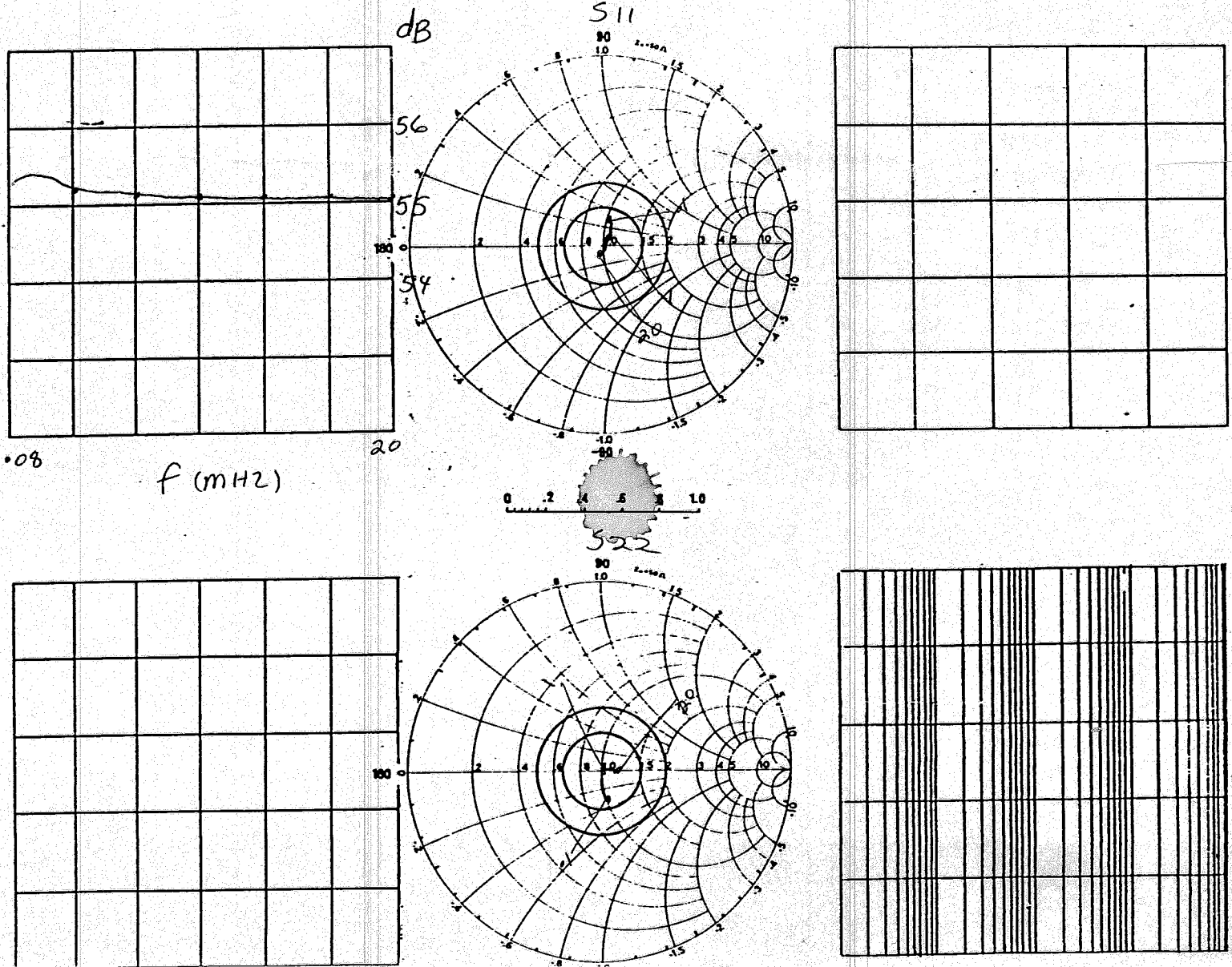
MODEL NUMBER W20ATC

SERIAL NUMBER A920 01

DATE 5/16/89

	SPEC'D.	MEASURED
CENT. FREQ.		
1 dB B.W.	.08-20 mHz	See Plot
_ dB B.W.		
GAIN	53 dB	" "
FLATNESS	±.5 dB	" "
NOISE FIG.	1.2 dB	1.1 dB

	SPEC'D.	MEASURED
VSWR IN	2:1	See S11
VSWR OUT	2:1	" S22
P/O @ 1 dB COMPR.	+5 dBm	> +8 dBm
I_C @ +15 V		35 mA



International
IOR Rectifier

Data Sheet No. PD-6.011E

IR2110

HIGH AND LOW SIDE DRIVER

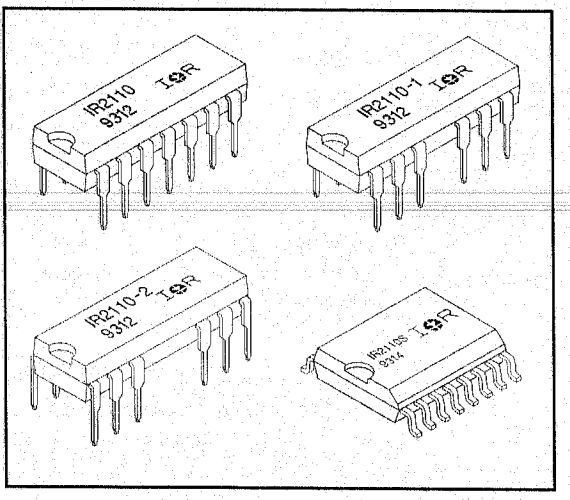
Features

- Floating channel designed for bootstrap operation
  Fully operational to +500V
  Tolerant to negative transient voltage
  dV/dt immune
- Gate drive supply range from 10 to 20V
- Undervoltage lockout for both channels
- Separate logic supply range from 5 to 20V
  Logic and power ground ±5V offset
- CMOS Schmitt-triggered inputs with pull-down
- Cycle by cycle edge-triggered shutdown logic
- Matched propagation delay for both channels
- Outputs in phase with inputs

Product Summary

V_{OFFSET}	500V max.
$I_{O+/-}$	2A / 2A
V_{OUT}	10 - 20V
$t_{on/off}$ (typ.)	120 & 94 ns
Delay Matching	10 ns

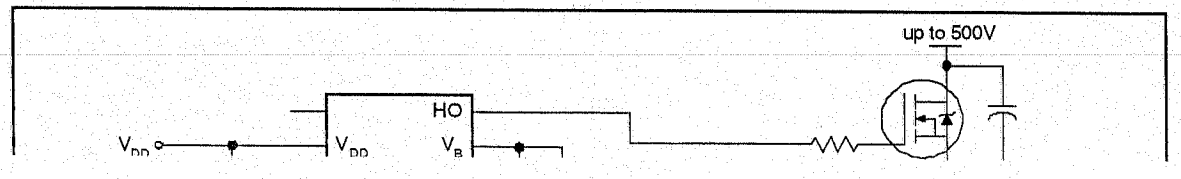
Packages



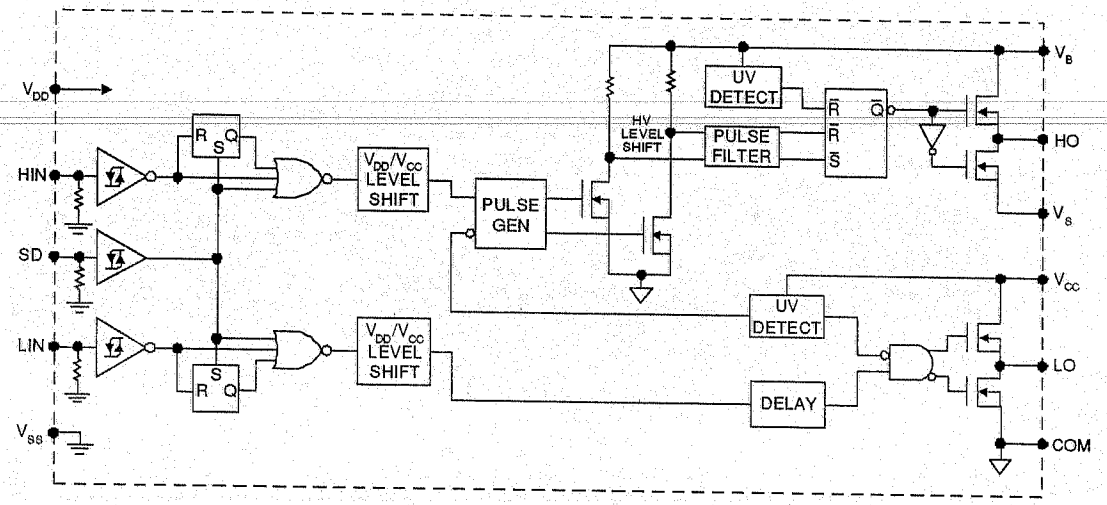
Description

The IR2110 is a high voltage, high speed power MOSFET and IGBT driver with independent high and low side referenced output channels. Proprietary HVIC and latch immune CMOS technologies enable ruggedized monolithic construction. Logic inputs are compatible with standard CMOS or LSTTL outputs. The output drivers feature a high pulse current buffer stage designed for minimum driver cross-conduction. Propagation delays are matched to simplify use in high frequency applications. The floating channel can be used to drive an N-channel power MOSFET or IGBT in the high side configuration which operates up to 500 volts.

Typical Connection



Functional Block Diagram

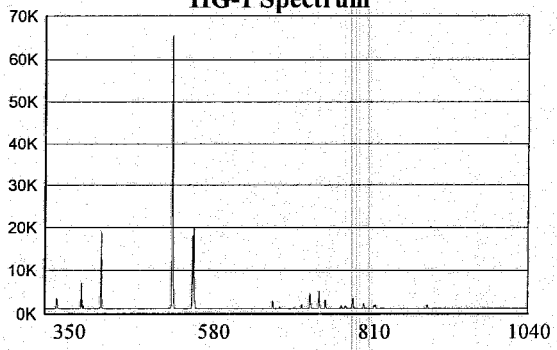


Lead Definitions

Lead Symbol	Description
V_{DD}	Logic supply
HIN	Logic input for high side gate driver output (HO), in phase
SD	Logic input for shutdown
LIN	Logic input for low side gate driver output (LO), in phase
V_{SS}	Logic ground
V_B	High side floating supply
HO	High side gate drive output
V_S	High side floating supply return
V_{CC}	Low side supply
LO	Low side gate drive output
COM	Low side return

Lead Assignments

HG-1 Spectrum



Ocean Optics

Wavelength Calibration Data Sheet

Built for:
Order Number:
Model: **USB4000-VIS-NIR**
Grating: GRATING_#3 - 600 Lines Blazed at 500 nm
Bandwidth: 350 - 1040 nm
Options: DET4-350-1000. Detector, NoneLens, SLIT-25 Slit,

Serial Number: **USB4H02818**

λ	Pixel #	Predicted λ	Δλ
365.015	90	365.137	-0.122
404.656	278	404.664	-0.008
435.835	427	435.834	0.001
576.959	1115	576.947	0.012
585.249	1157	585.303	-0.054
594.483	1203	594.523	-0.040
597.553	1218	597.544	0.009
602.999	1245	603.041	-0.042
607.434	1267	607.467	-0.033
609.616	1278	609.571	0.045
614.306	1302	614.301	0.005
616.359	1312	616.281	0.078
621.728	1339	621.695	0.033
626.649	1364	626.643	0.006
630.479	1383	630.501	-0.022
633.443	1398	633.447	-0.004
650.653	1486	650.689	-0.036
653.288	1499	653.252	0.036
659.895	1532	659.905	-0.010
667.828	1573	667.814	0.014
671.704	1593	671.681	0.023
692.947	1702	692.934	0.013
696.543	1720	696.523	0.020
703.241	1755	703.269	-0.028
717.394	1828	717.311	0.083
724.516	1866	724.474	0.042
738.398	1938	738.263	0.135
743.890	1967	743.894	-0.004
748.887	1994	748.911	-0.024
750.387	2002	750.393	-0.006
763.510	2071	763.470	0.040
772.421	2118	772.349	0.072
794.817	2238	794.858	-0.041
826.452	2409	826.366	0.086
837.760	2471	837.678	0.082
849.535	2536	849.505	0.030
852.144	2550	852.131	0.013
865.438	2624	865.425	0.013

This is a sample of calibration peaks used as there were more than can be shown on this page

Calibration Coefficients

First Coefficient:	0.2124820352
Second Coefficient:	-4.19653e-006
Third Coefficient:	-5.05205e-010
Intercept:	345.95956421
Regression Fit:	0.9999992847

Stray Light Measurements (AU)

Holmium Oxide (444nm):	1.48
Yellow Dye:	2.10
Blue Dye:	2.82
Molybdate:	N/A
OG550 Filter:	2.43
RG850 Filter:	3.33
FG3 Filter:	1.31

Bernarda Cygan

Calibrated By: Mary.Lopez
Calibrated: 04-February-2011

Linearity Test

Serial Number **USB4H02818**

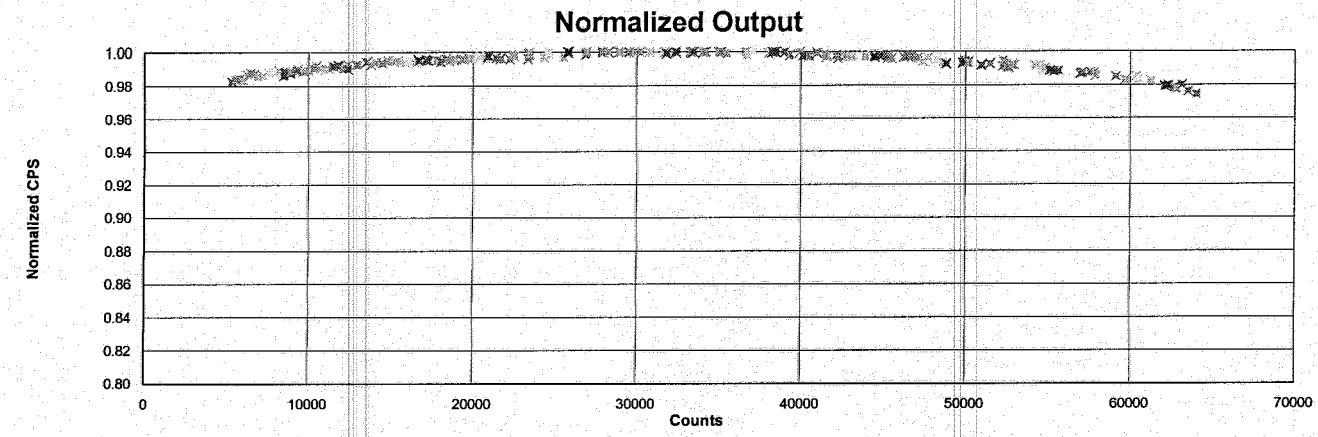
Tech: Mary.Lopez

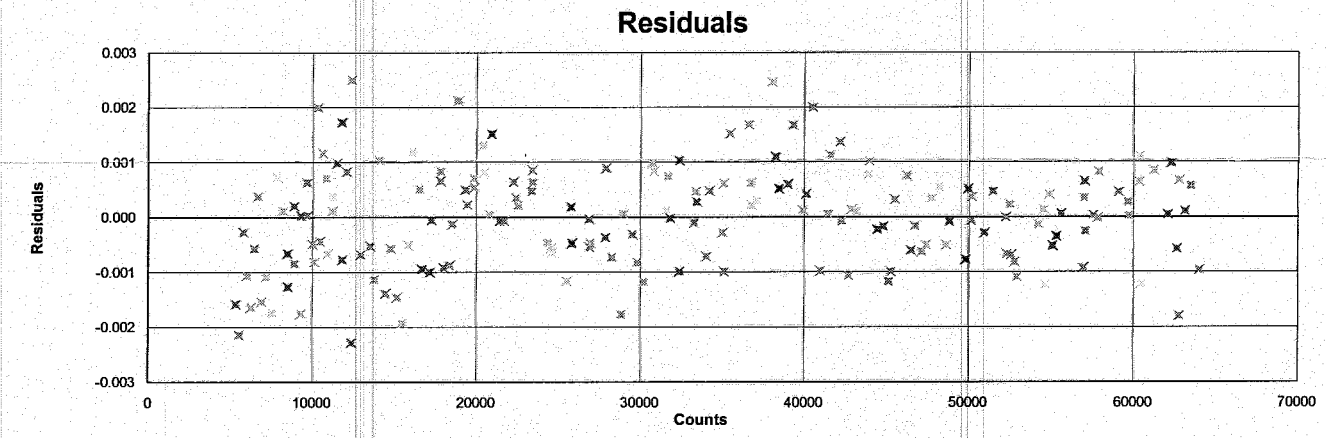
Linearity: **99.90783**

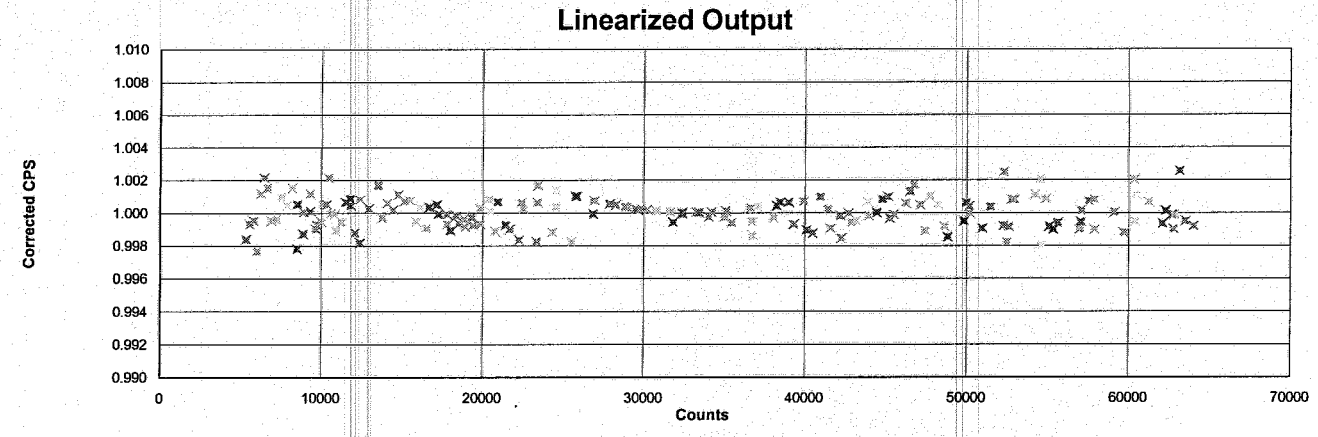
Tested: 2/4/11

Test # 40,348.00

Intercept	0.974718
Coefficient 1	2.0906e-006
Coefficient 2	-4.58813e-011
Coefficient 3	-2.3657e-015
Coefficient 4	1.99953e-019
Coefficient 5	-5.86331e-024
Coefficient 6	7.76084e-029
Coefficient 7	-3.90471e-034







Max **1.00255227**

Min **0.99767292**

CrystaLaser®
4750 Longley Lane, Suite 205, Reno, NV 89502, USA
Tel: 775 348 4820 Fax: 775 348 7047
E-mail: sales@crystalaser.com
Web: www.crystalaser.com

Certificate of Compliance

This certifies that the lasers have been manufactured, inspected and tested at CrystaLaser, and are in compliance with the quoted specifications and drawings.

Data Sheet

S/N	Model No.
2902028-3780	DL440-025

Wavelength	444.1 nm
Output Power	25 mW
Transverse Mode	TEMoo
Longitudinal Mode	Several longitudinal mode
Beam Diameter ($1/e^2$)	1 mm
Beam Divergence	0.6 mrad (full angle)
Output Stability	1 % over 24 hours
Noise (rms)	< 0.5 %
Operation Voltage	90 to 250VAC

Customer Options

☒ N/A ☐ ultra-stable ☐ beam collimation (beam diameter and divergence)

☐ fiber coupling (output power is measured after fiber) ☐ optical isolator ☐ CL-2005 power supply

☐ others ( )

Test Engineer: jinsong

QA :

Record Date: 02/27/2009

Printed on: February 27, 2009

Ocean Optics Inc.
First in Photonics™

Wavelength Calibration Data Sheet

Built For:	**University of Cal. - San Diego**
Order Number:	**98700/98702**
Model:	**USB2000+**
Description:	USB 2.0 Fiber Optic Spectrometer
Grating:	600 Lines Blazed at 750 nm
Bandwidth:	475 - 1100 nm
Options Installed:	L2 Lens, 10um Slit, GG475 Filter
Serial Number:	**USB2+F00035** **Master**

λ	Pixel #	Predicted λ	Δλ
546.074	217	546.130	-0.056
576.959	302	577.037	-0.078
579.065	308	579.205	-0.140
696.543	640	696.386	0.157
706.722	670	706.704	0.018
727.294	730	727.207	0.087
738.398	763	738.408	-0.010
750.387	798	750.228	0.159
763.510	837	763.327	0.183
772.421	864	772.351	0.070
801.479	952	801.512	-0.033
811.531	982	811.366	0.165
826.452	1028	826.387	0.065
842.465	1078	842.596	-0.131
852.144	1108	852.261	-0.117
866.794	1153	866.675	0.119
912.297	1298	912.436	-0.139
922.450	1331	922.705	-0.255
935.418	1373	935.696	-0.278
1095.120	1913	1094.908	0.212

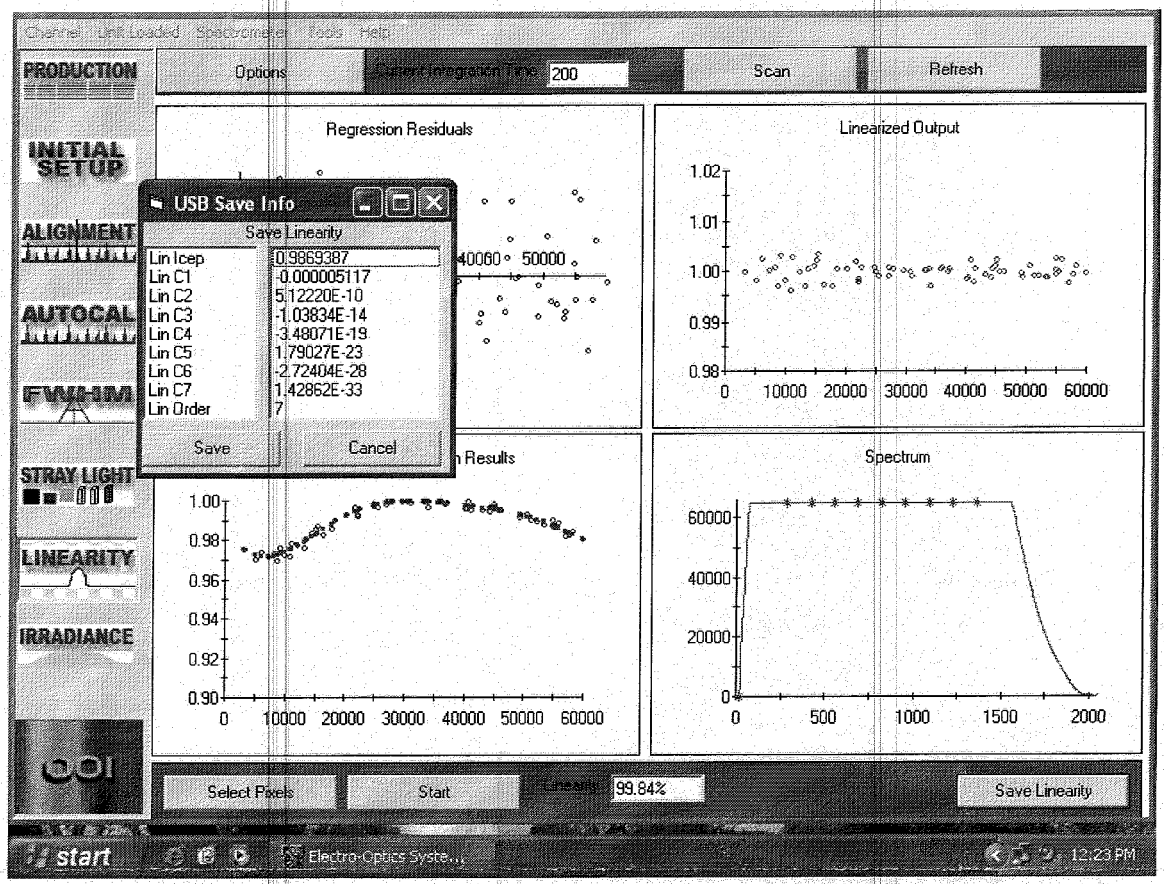
Calibration Coefficients

First Coefficient:	0.376516643
Second Coefficient:	-2.48566E-05
Third Coefficient:	0
Intercept:	465.596114
Regression Fit:	0.999999389

Stray Light Measurements (AU)

Holmium Oxide (444nm):	N/A
Yellow Dye:	N/A
Blue Dye:	3.29
Molybdate:	N/A
OG550 Filter:	2.26
RG850 Filter:	3.92
FG3 Filter:	1.22

11/01/07 Dawn Robinson


Channel Unit Loaded Spectrometer Tools Help
PRODUCTION
INITIAL SETUP
ALIGNMENT
AUTOCAL
FWHM
STRAY LIGHT
LINEARITY
IRRADIANCE
Options
Current Integration Time 200
Scan
Refresh
Regression Residuals
Linearized Output
USB Save Info
Save Linearity
Lin Icep 0.9869387
Lin C1 -0.000005117
Lin C2 5.12220E-10
Lin C3 -1.03834E-14
Lin C4 -3.48071E-19
Lin C5 1.79027E-23
Lin C6 -2.72404E-28
Lin C7 1.42862E-33
Lin Order 7
Save
Cancel
Results
Spectrum
Select Pixels
Start
Linearity 99.84%
Save Linearity
start
Electro-Optics Syste...
12:23 PM

USB+2F00035

Ocean Optics Inc.
First in Photonics™

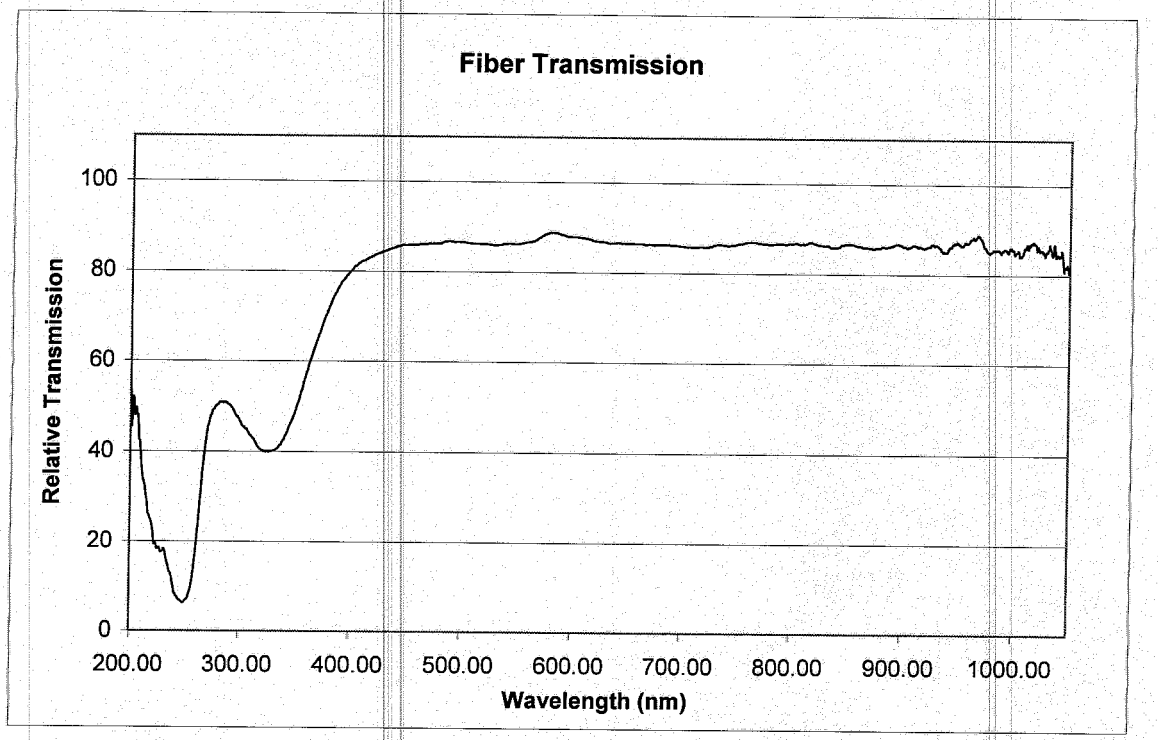
Fiber Assembly Report

Part #:	P400-2-VIS/NIR
Date:	**November 5, 2007**
Assembly #:	EOS-42101-105
Connector 1 #:	SMA-905
Connector 2 #:	SMA-905
Sales Order #	STOCK

www.OceanOptics.com
Phone:727-733-2447
Fax:727-733-3962
Info@OceanOptics.com
830 Douglas Ave
Dunedin, FL 34698

Ask about our custom line of Optical Probes and Assemblies.

Fiber Type:	VIS/NIR	**Jacketing:**	Zip Tube
Fiber Core Diameter:(um)	400um	**Length (meters):**	2.00



Inspection Checklist X
Polish: X
Concentricity: X
Cap Placement: X
Labeling: X
Color Coding: X
Ferrule length: X

Inspected by: Van Foster
Van Foster

RoHS - Compliant