CMG-1T CALIBRATION SHEET

WORKS ORDER:	12802	DATE:	07-Mar-2013
SERIAL NUMBER:	T1074	TESTED BY:	S. Goddard

	Velocity Output V/m/s (Differential)	Mass Position Output (Acceleration output) $V/m/s^2$	Feedback Coil Constant $Amp/m/s^2$
VERTICAL	2 x 1483	2239	0.01483
NORTH/SOUTH	2 x 1499	1466	0.01466
EAST/WEST	2 x 1486	1455	0.01455

Power Consumption: 60mA @ +12V input
Calibration Resistor: 51000

NOTE: A factor of 2 x must be used when the sensor outputs are used differentially (also known as push-pull or balanced output). Under no conditions should the negative outputs be connected to the signal ground. A separate signal ground pin is provided.

POLES AND ZEROS TABLE

WORKS ORDER NUMBER: 12802

SENSOR SERIAL NO: T1074

Velocity response output, Vertical Sensor:

POLES (HZ)	ZEROS HZ
$-1.964 \times 10^{-3} \pm j1.964 \times 10^{-3}$	0
-30.0529±j31.1211	0
-41.2564±j114.535	

Normalizing factor at 1 Hz: A = 27.7×10^{6}

Sensor Sensitivity: See Calibration Sheet.

Velocity response output, Horizontal Sensors:

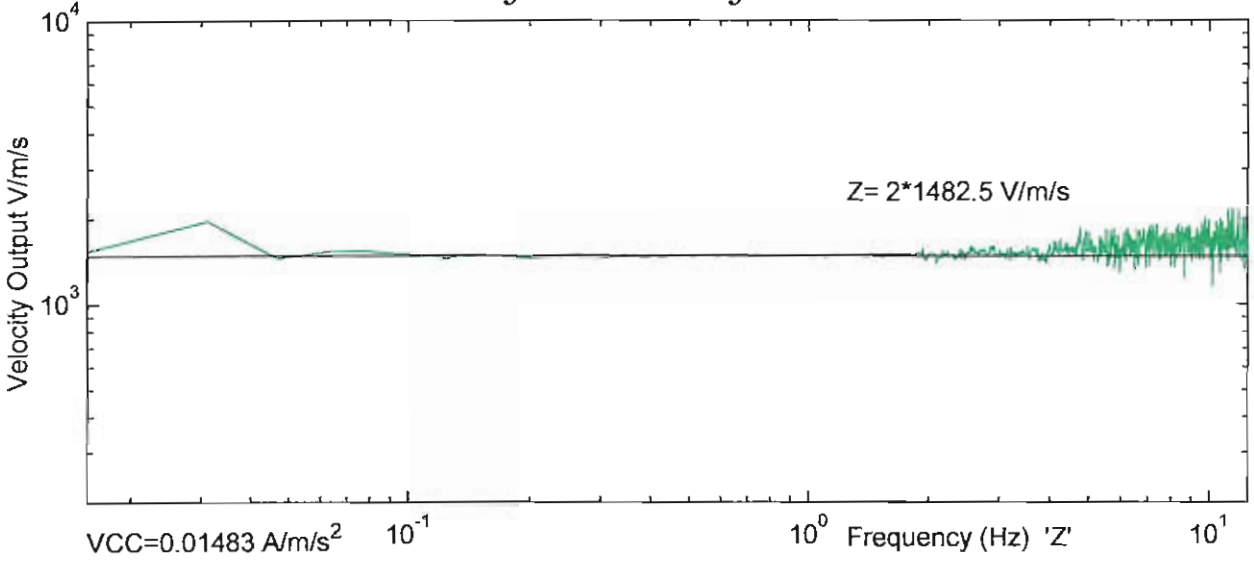
POLES (HZ)	ZEROS (HZ)
$-1.964 \times 10^{-3} \pm j1.964 \times 10^{-3}$	0
-30.0529±j31.1211	0
-41.2564±j114.535	

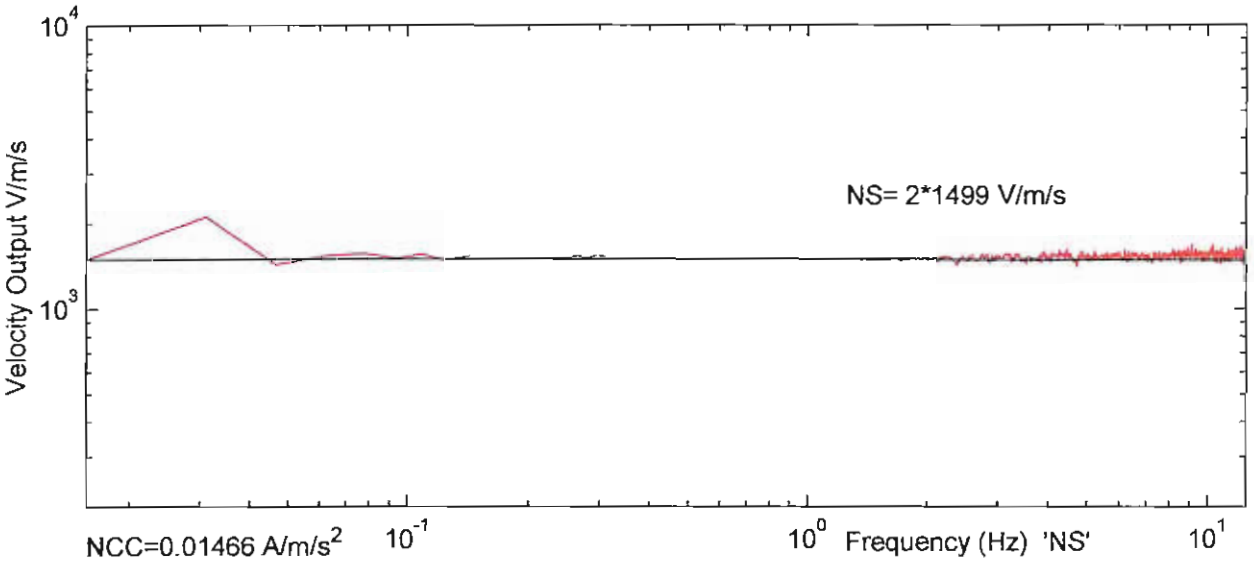
Normalizing factor at 1 Hz: A = 27.7×10^{6}

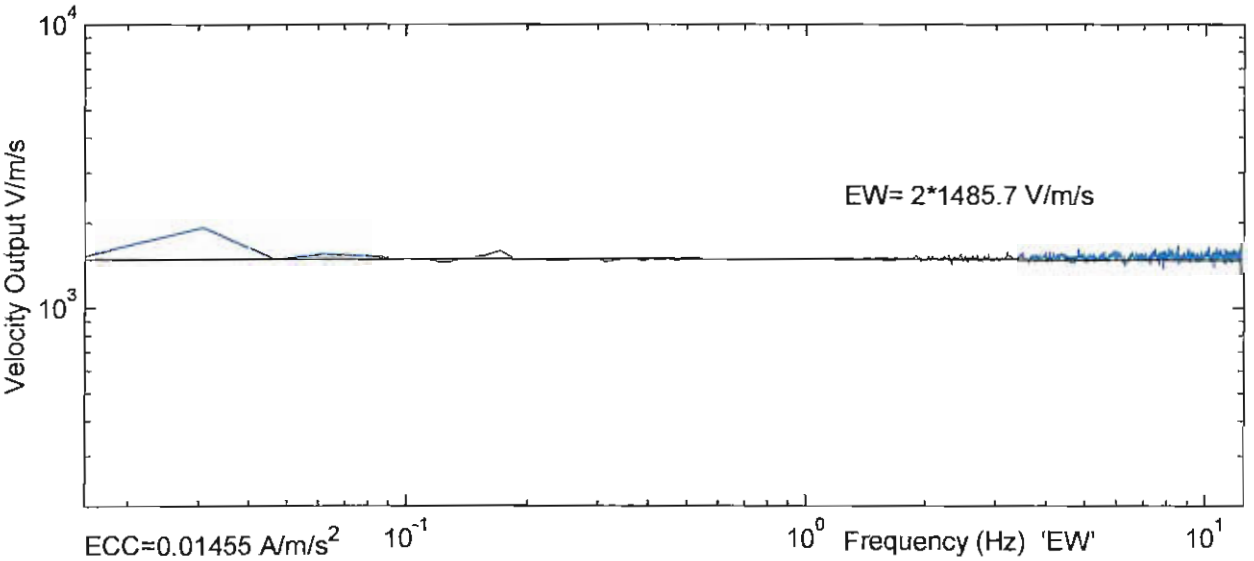
Sensor Sensitivity: See Calibration Sheet.

NOTE: The above poles and zeros apply to the vertical and the horizontal sensors and are given in units of Hz. To convert to Radian/sec multiply each pole or zero with 2π. The normalizing factor A should also be recalculated.

Calibration Information for :T1074 12802



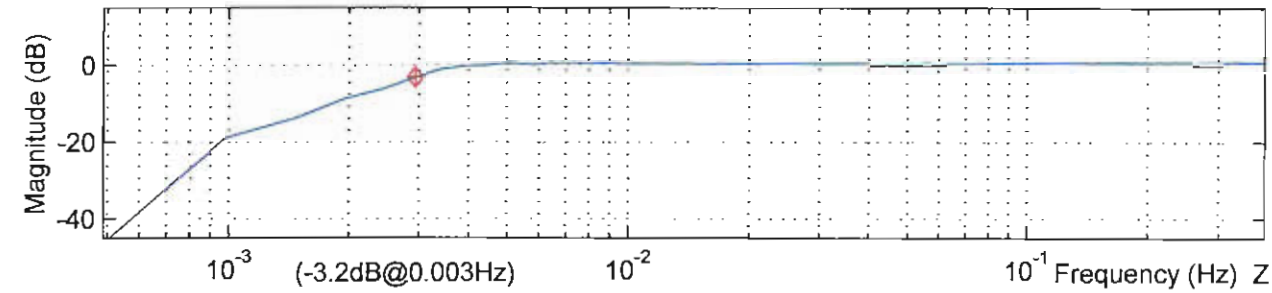


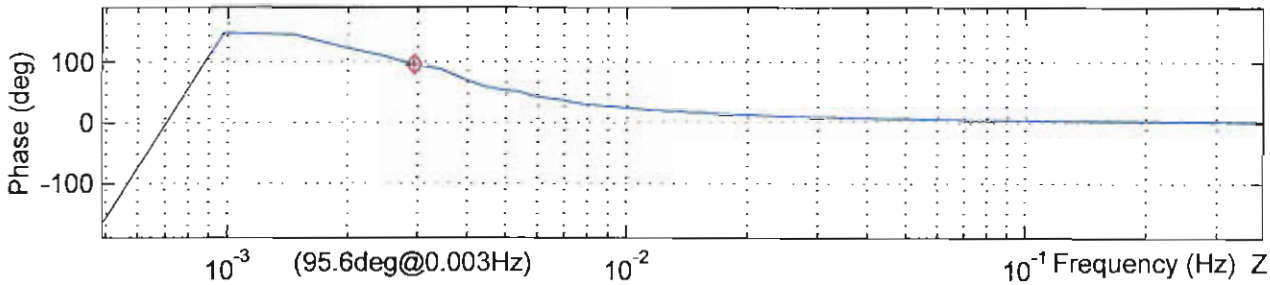


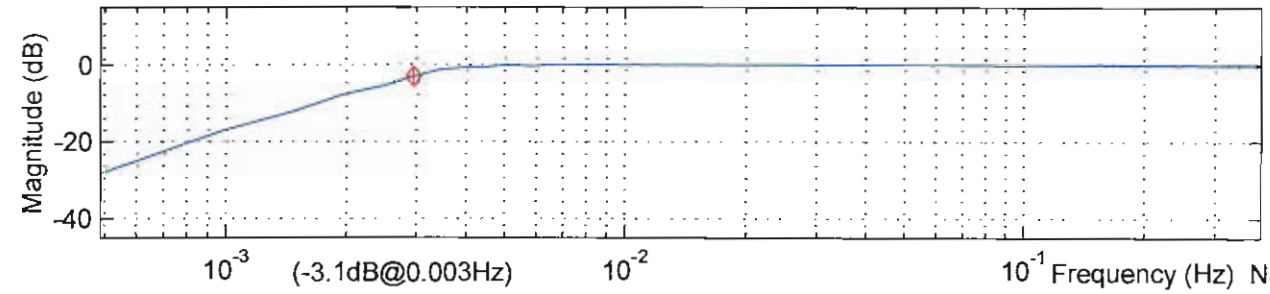
RCal =51000 Ohms

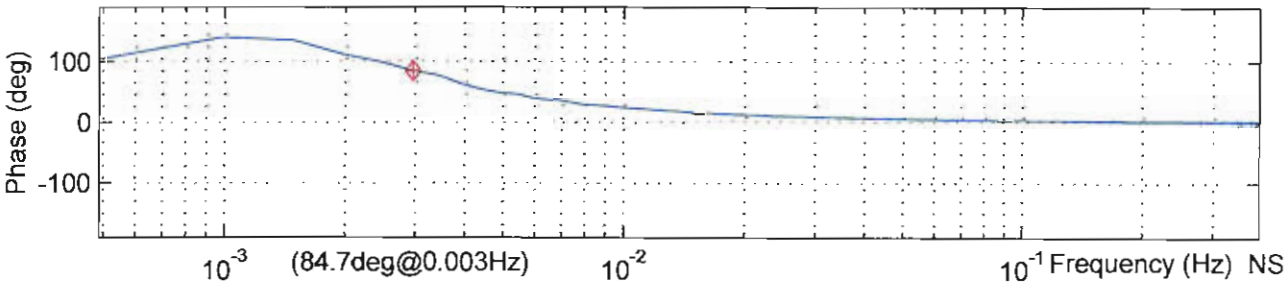
07-Mar-2013

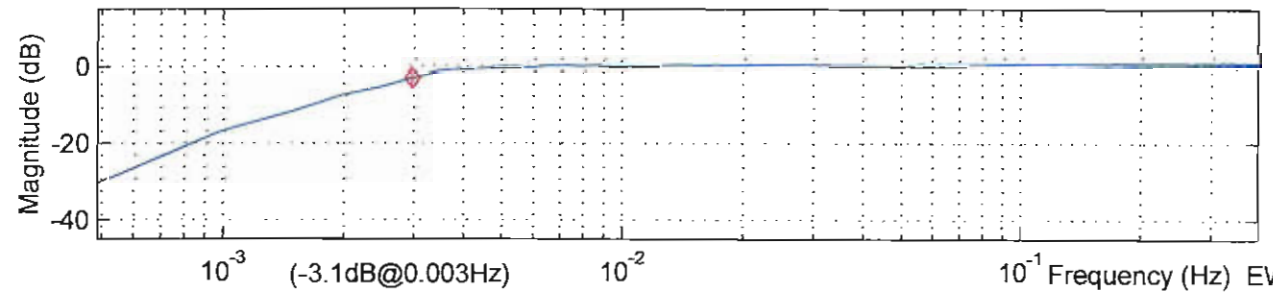
Normalized Frequency Response for :T1074, 12802

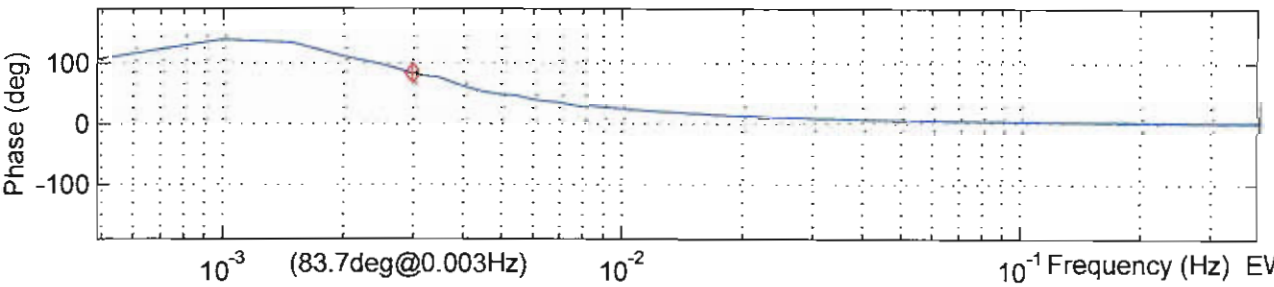












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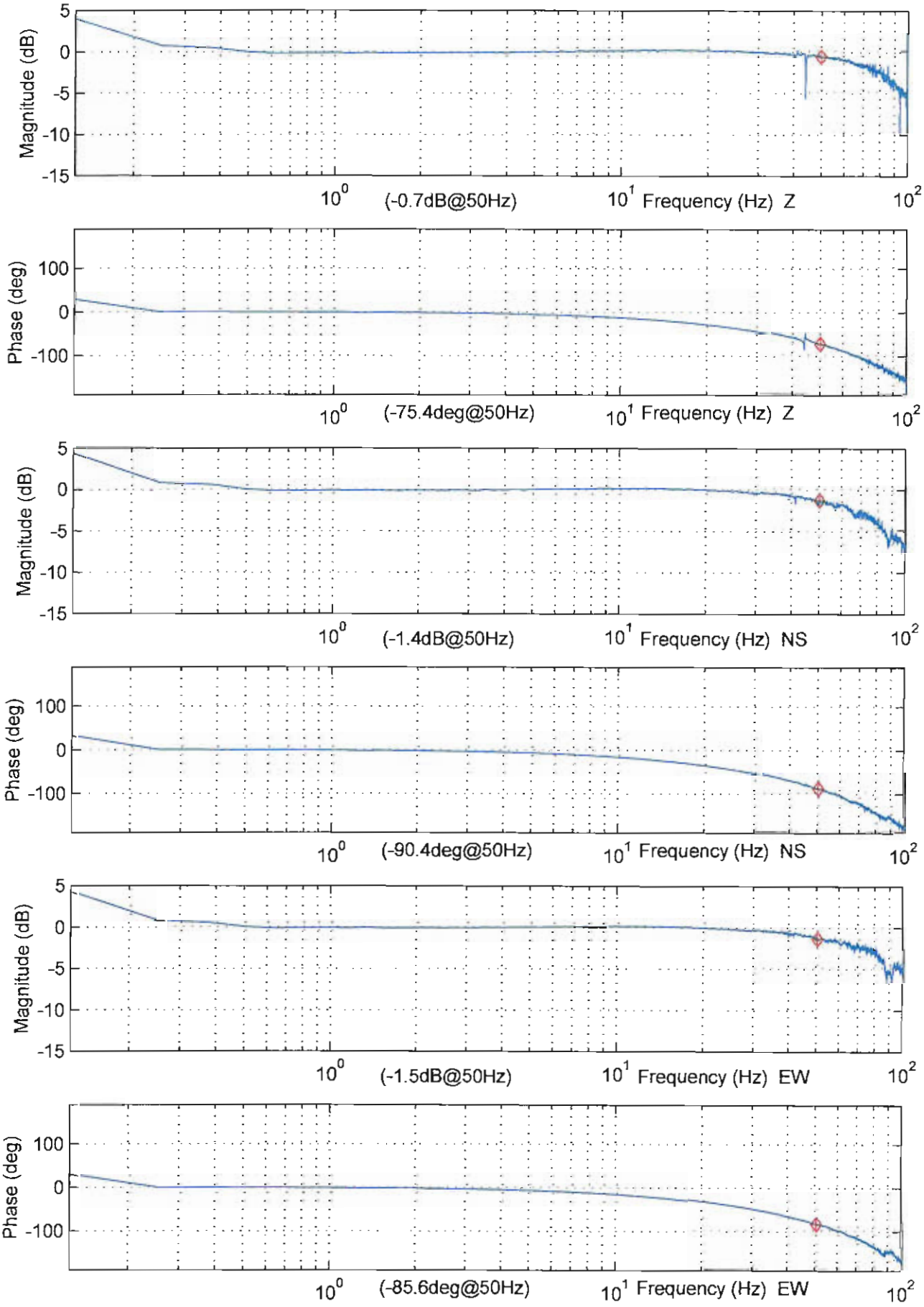
Normalized Frequency Response for :T1074, 12802



07-Mar-2013

GURALP SYSTEMS

GURALP SYSTEMS LIMITED, 3 MIDAS HOUSE, CALLEVA PARK,
ALDERMASTON, READING, RG7 8EA, UK.
TELEPHONE: +44 118 9819056 FAX: +44 118 9819943
sales@guralp.com

CMG-5T/TD/U Instrument Quality Certificate

This certificate identifies the tests and inspection carried out.

Sensor Serial Number.	TSCP2
	Pass
Sensor Noise Coherence.	
Frequency response. Document attached.	✓
Calibration. Document attached.	✓
Cable Lengths & Ancillaries as per customer order?	

Final Quality Approval. AJS

On behalf of Guralp Systems. Date 23/1/14

CMG-5T ABSOLUTE CALIBRATION
(ACCELERATION OUTPUTS)

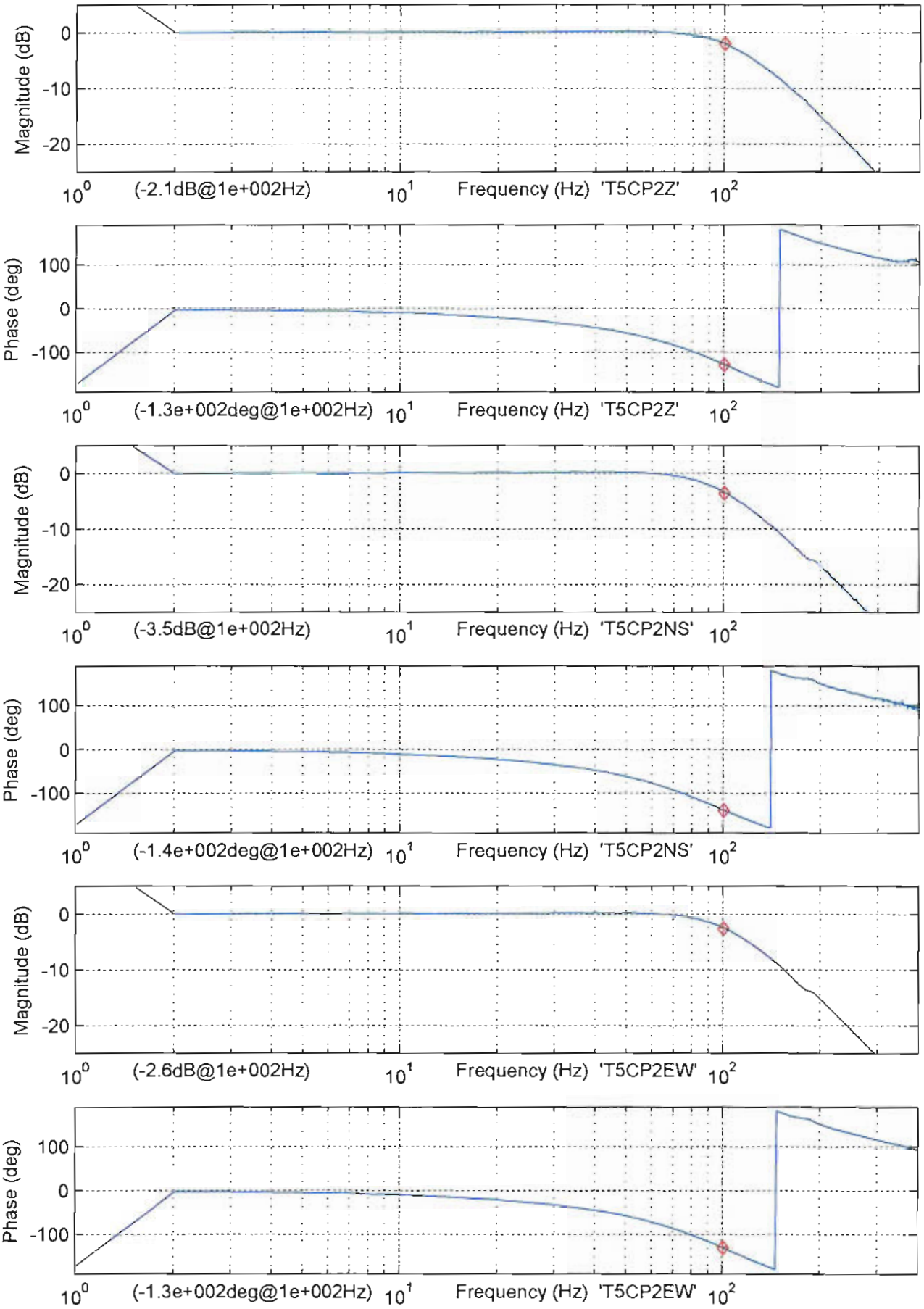
WORKS ORDER:	12802	DATE:	26/02/2013
SERIAL NUMBER:	T5CP2	TESTED BY:	SH
		OUTPUT at 1g	5 volts

	Acceleration Response $V/m/s^2$
VERTICAL	2 x 0.509
NORTH/SOUTH	2 x 0.509
EAST/WEST	2 x 0.509

Vertical component equivalent acceleration from calibration signal of:	1 Volt = $0.982 m/s^2$
North/South component equivalent acceleration from calibration signal of:	1 Volt = $0.982 m/s^2$
East/West component equivalent acceleration from calibration signal of:	1 Volt = $0.982 m/s^2$
Calibration enable signal polarity:	Active Low
Typical Current Consumption:	
This sensor operates from:	10 to 36 Volts

NOTE: A factor of 2 x must be used when the sensor outputs are used differentially (also known as push-pull or balanced output). Under no conditions should the negative outputs be connected to the signal ground. A separate signal ground pin is provided.

Frequency Response for :T5CP2 'WO12801'



HIGH TECH, INC.

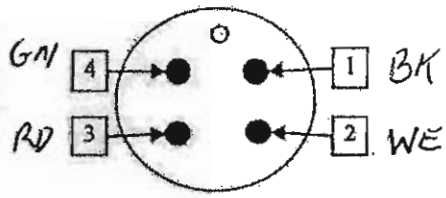
21120 Johnson Road
Long Beach, MS 39560

Tel. (228) 868-6632
Fax (228) 868-6645
hightechinc@att.net

299/1/57 Hydrophone Information 03/04/13
Model# HTI-90-U/Diff
Connector: Subconn IL-4-M & DLSA-M

Connector Pinout

Pin 1	+12VDC
Pin 2	12VDC Return / Signal Gnd
Pin 3	Signal + Output
Pin 4	Signal - Output



Test Data

Serial Number	Hydrophone Sensitivity dB re: 1V/uPa	Current mA
299463	-174.8	2.22
299464	-174.1	2.23
299465	-173.9	2.21
299466	-174.2	2.24
299467	-174.0	2.22
299468	-174.5	2.23
299469	-174.4	2.2
299470	-174.6	2.22
AVG	**-174.3**	**2.22**
VAR	**0.1**	**0.00**
STD	**0.3**	**0.01**
MAX	**-173.9**	**2.24**
MIN	**-174.8**	**2.20**
DIF	**0.9**	**0.04**

5m cable

Sensitivity was measured using the comparison method
Reference hydrophone = 999901
Measurements traceable to USRD Newport, RI

Hydrophones listed on this page:
- Leaked less than 0.1uA @ 27VDC after 1hr @ 100PSI hydrostatic pressure
- Passed shield integrity test
- Have the same Polarity Response

BSS 2/28/13

Voltage	12VDC
Preamp Mode	Voltage
Source Capacitor	800pF
Termination Resistor	-

Expected Gain	12dB
Response High (-3dB)	20kHz
Response Low (-3dB)	2Hz

	Gain (dB)								
Preamp#	2Hz	5Hz	50Hz	100Hz	1KHz	5KHz	10KHz	20KHz	30KHz
1	9.62	11.83	12.42	12.42	12.42	12.42	12.43	12.44	12.47
2	9.60	11.83	12.43	12.44	12.44	12.44	12.44	12.46	12.49
3	9.55	11.81	12.42	12.42	12.42	12.42	12.43	12.44	12.47
4	9.57	11.80	12.42	12.43	12.43	12.43	12.43	12.45	12.48
5	9.58	11.83	12.42	12.42	12.42	12.42	12.43	12.44	12.47
6	9.54	11.84	12.41	12.42	12.42	12.42	12.42	12.44	12.47
7	9.57	11.83	12.43	12.43	12.43	12.43	12.44	12.45	12.48
8	9.68	11.84	12.41	12.42	12.42	12.42	12.42	12.44	12.47
AVG	9.59	11.82	12.42	12.43	12.43	12.43	12.43	12.45	12.47
VAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STD	0.04	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
MAX	9.68	11.84	12.43	12.44	12.44	12.44	12.44	12.46	12.49
MIN	9.54	11.80	12.41	12.42	12.42	12.42	12.42	12.44	12.47
DIF	0.14	0.04	0.02	0.02	0.02	0.02	0.02	0.02	0.02

	Phase (deg)								
Preamp#	2Hz	5Hz	50Hz	100Hz	1KHz	5KHz	10KHz	20KHz	30KHz
1		-159.7	-177.9	-179.0	179.9	178.9	177.8	175.6	173.4
2		-159.5	-177.8	-179.0	179.9	178.9	177.8	175.6	173.4
3		-159.9	-177.9	-179.0	179.8	178.9	177.8	175.5	173.4
4		-159.7	-177.9	-179.0	179.9	178.9	177.8	175.6	173.4
5		-159.7	-177.9	-179.0	179.9	178.9	177.8	175.6	173.4
6		-159.6	-177.9	-179.0	179.9	178.9	177.8	175.6	173.4
7		-159.4	-177.8	-179.0	179.9	178.9	177.8	175.6	173.4
8		-159.9	-177.9	-179.0	179.9	178.9	177.8	175.5	173.4
AVG		-159.7	-177.9	-179.0	179.8	178.9	177.8	175.6	173.4
VAR		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
STD		0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MAX		-159.4	-177.8	-179.0	179.9	178.9	177.8	175.6	173.4
MIN		-159.9	-177.9	-179.0	179.8	178.9	177.8	175.5	173.4
DIF		0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DM24 CALIBRATION

WORKS ORDER:12802 **DIGITISER SERIAL NUMBER:**A4278

SYSTEM ID:4278 CPLD:A0.E1
UNIT ID:VEL4, ACC4 BOOTLOADER:MK3BOOT302.IMG
OUTPUT DATA FORMAT:GCF DSP SOFTWARE:DSP1090.BIN
BAUD RATE: 115200 SYSTEM: DMNET107b14.IMG

VELOCITY CHANNELS

Channel:	VEL4Z2	Vertical	3.231 µV/Count
	VEL4N2	North/South	3.231 µV/Count
	VEL4E2	East/West	3.221 µV/Count
	ACC4Z2	Vertical	3.224 µV/Count
	ACC4N2	North/South	3.230 µV/Count
	ACC4E2	East/West	3.235 µV/Count

MASS POSITION CHANNELS

Sample Rate: 4 samples/sec (Default)

Channel:	VEL4M8	Vertical	291.15 µV/Count
	VEL4M9	North/South	291.11 µV/Count
	VEL4MA	East/West	291.64 µV/Count

CAL SIGNAL MONITOR

VEL4X2/ VEL4C2 3.223 µV/Count

GPS RECEIVER

PWM: 8000 Counts
At Temperature Reading: 23°C

POWER CONSUMPTION

Digitiser Power Consumption	80mA @ 12v
GPS Power Consumption	28mA @ 12v

AUXILIARY CHANNELS

Sample Rate: 4 samples/sec (Default)

Channel:		
	VEL4MB	291.73 µV/Count
	VEL4MC	291.88 µV/Count
	VEL4MD	292.10 µV/Count
	VEL4ME	290.19 µV/Count
	VEL4MF	290.87 µV/Count

National Oceanography Centre
NATURAL ENVIRONMENT RESEARCH COUNCIL

National Oceanography Centre
University of Southampton Waterfront Campus
European Way, Southampton SO14 3ZH
United Kingdom

Pressure Test Lab +44 (0) 23 8059 6309
http://noc.ac.uk

Date: 19/12/13

Purchase Order; 30082

HYDROSTATIC TEST REPORT

Company: Guralp Systems Limited

Address: 3 Midas House
Calleva Park
Aldermaston
Reading
RG7 8EA

Equipment: 1 x ITOBS Sphere
Serial No; 58328-00005

Schedule: 620 bar hold for 1 hour.

Comments: No visual signs of leaks or damage.

Andy Staszkiewicz
023 8059 6309