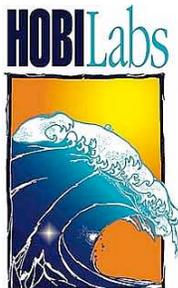


HydroDAS HD110410

User's Manual Addendum and System Guide

for
UPMC Villefranche-Sur-Mer

Version B, October 2011



**Hydro-Optics, Biology & Instrumentation
Laboratories**

Lighting the Way in Aquatic Science

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Revision History

Rev B, October 2011:

- Add notes about monitoring HydroDAS console port (section 4.1)
- Specify a-Sphere switch in off position during deployment (section 4.3)
- Update script to version 101, including setting instrument clocks (section 5.4); reflect this change in instrument clock descriptions, section 6.

Rev A, September 2011: First released version

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1 SYSTEM OVERVIEW

HOBILabs has configured HydroDAS HD110410 to be the controller and logger for autonomous deployment of a package consisting of the following components:

- HOBILabs a-Sphere
- HOBILabs Gamma-4 Transmissometer
- HOBILabs HydroScat-6
- Seabird SBE-49 CTD
- An optional analog-output sensor, not included in the package delivered by HOBILabs, presumed to be a WET Labs C-Star
- Two HOBILabs HydroBatt batteries.

Custom features of the system include connectors and cables configured specifically for the above instruments, and a specially programmed script to provide autonomous logging functions.

Figure 1 shows a schematic of the system connections. The computer can be connected at any time, but is required only for setting the system up and offloading data. During deployment the HydroDAS operates autonomously. The power supply is also not required, but may be used to conserve battery capacity when using the power supply during operation on deck.

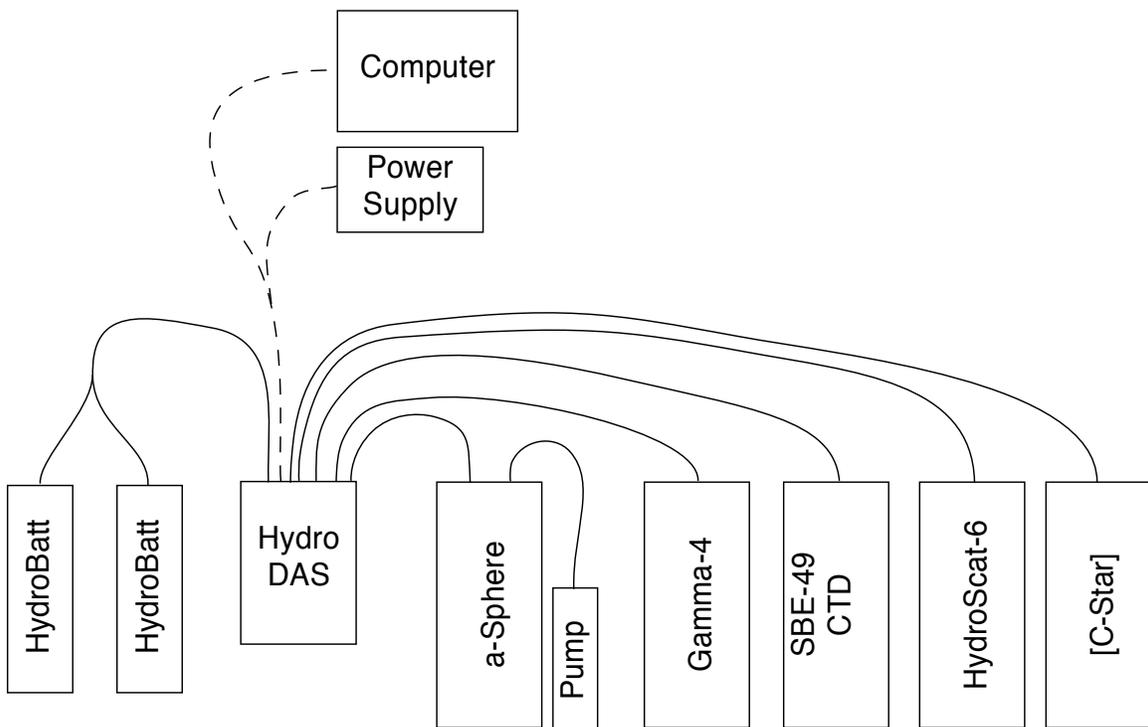


Figure 1. System Schematic

2 CONNECTOR CONFIGURATION

2.1 Connector and Pin Assignments

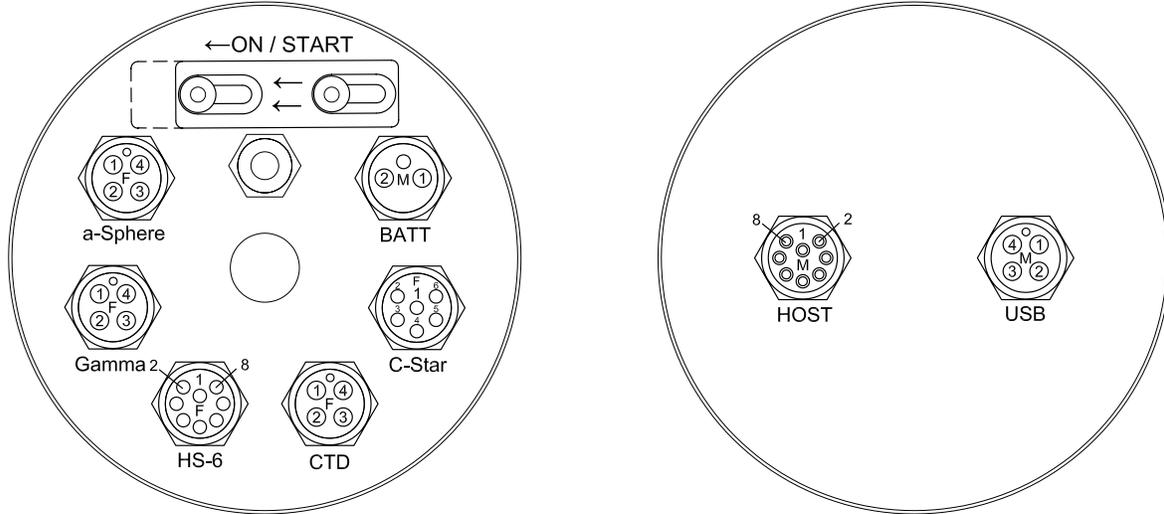


Figure 2. HydroDAS HD110410 End Cap Configuration

Function	Connector	Pin	Pin Function
a-Sphere	MCBH4F (marked black)	1	Inst Xmit
		2	Common
		3	Inst Rcv
		4	Inst V+
Gamma-4	MCBH4F (marked yellow)	1	Inst Xmit
		2	Common
		3	Inst Rcv
		4	Inst V+
HydroScat-6	MCBH8F	1	Inst V+
		2	Common
		3	Inst Rcv
		4	Inst Xmit
		5	NC
		6	NC
		7	NC
		8	NC
CTD	MCBH4F* (marked red)	1	Common
		2	Inst Rcv
		3	Inst Xmt
		4	Inst V+
Spare port, wired for WET Labs C- Star	MCBH6F	1	Common
		2	Inst Rcv
		3	NC
		4	Inst V+
		5	Inst Xmt
		6	NC
Battery In	MCBH2M	1	Common
		2	DAS V+

Bottom End Cap			
Function	Connector	Pin	Pin Function
USB	MCBH4M	1	Common
		2	USB sig
		3	USB sig
		4	+5V
Host	MCBH8M	1	Inst V+
		2	Common
		3	Host-Rcv
		4	Host Tx
		5	NC
		6	OS Rcv
		7	OS Tx
		8	NC

2.2 Individual Connector Notes

- Input voltage on both the battery input and the host power input may be up to 18 V. It is safe to apply power to both inputs. Power will be drawn from the source with the highest voltage.
- The current limit on the a-Sphere port is 2.5 A, as opposed to 1 A for the others.
- There are three four-pin connectors corresponding to the a-Sphere, Gamma-4, and CTD. It is important to assign these properly and especially not to swap the CTD with any other, because its wiring is different from the others. To reduce confusion, the connectors and cables are marked with colors:
 - a-Sphere: Black
 - Gamma-4: Yellow
 - CTD: Red

3 SOFTWARE

Two programs provide the main functions needed for using the HydroDAS: DASHost and USBLink. Some of the functions performed by DASHost are also accessible through the DAS console port, using a serial terminal program such as HyperTerminal.

DASHost provides complete control over the HydroDAS's functions in real time, as well as script editing and various other functions including setting its real-time clock. DASHost is not required for routine operation of a script-controlled profiling logger, but is useful for setup and testing. It is described in complete detail in the HydroDAS User's Manual.

USBLink provides the one major function not included in DASHost: data offloading through USB.

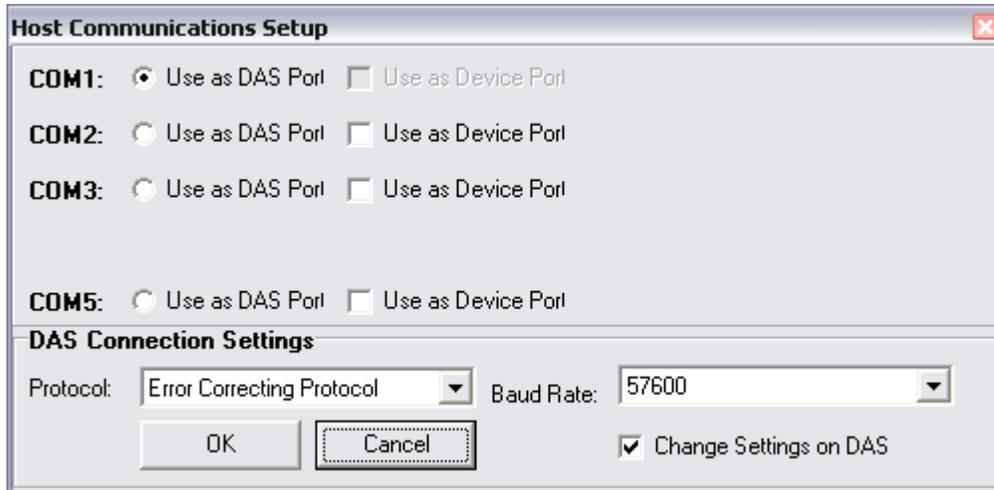
3.1 Installation

Run the program InstallDAS_HD110410.exe to install all the necessary files on your computer. Some further setup is required after installation, as explained in the following sections.

3.2 DASHost Setup

After installing the program files, connect the HydroDAS to a serial port on your computer, using the HydroDAS Power/Data Interface (PDI) cable. Be sure to use the port connector labeled "host port."

Start DASHost. Because it does not yet know which ports to use for interfacing, you may receive an error message and a dialog box instructing you to enter the number of a comm port. If so, click Cancel in that dialog box, then select Set Up Communication Ports from the File menu in DASHost. You will see a dialog box similar to the following. The exact contents depend on the ports installed on your computer.



Select the port number that corresponds to the port the PDI cable is connected to. If you do not know which that is, you can try each one. When you click OK with the correct port selected, within a few seconds you should see the DASHost Desktop background change from gray to white, indicating an active connection.

3.3 USB Software Setup

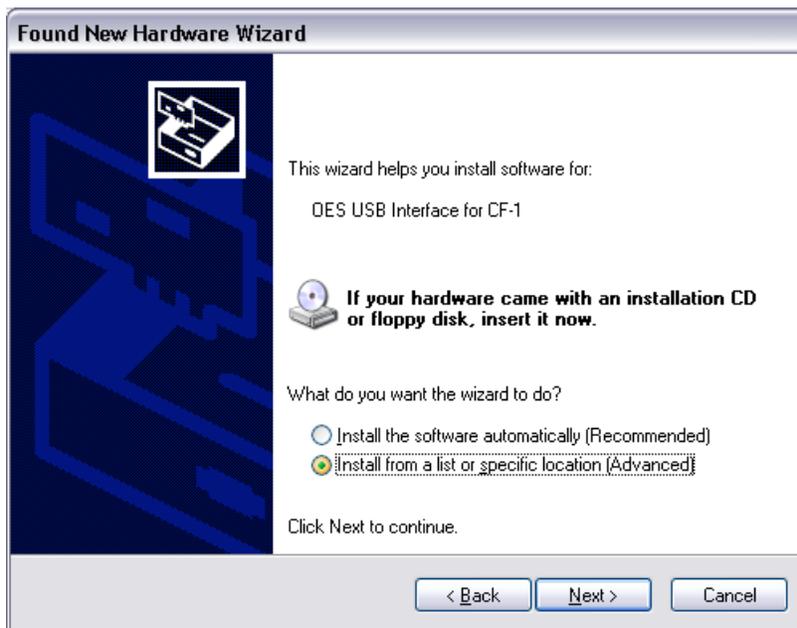
The installer you ran in section 3.1 should also have installed a folder named HOBI USBLink Drivers on your desktop. This will be used in the following procedure. The procedure varies depending on which version of Windows you are using.

USB Driver Installation (Windows XP)

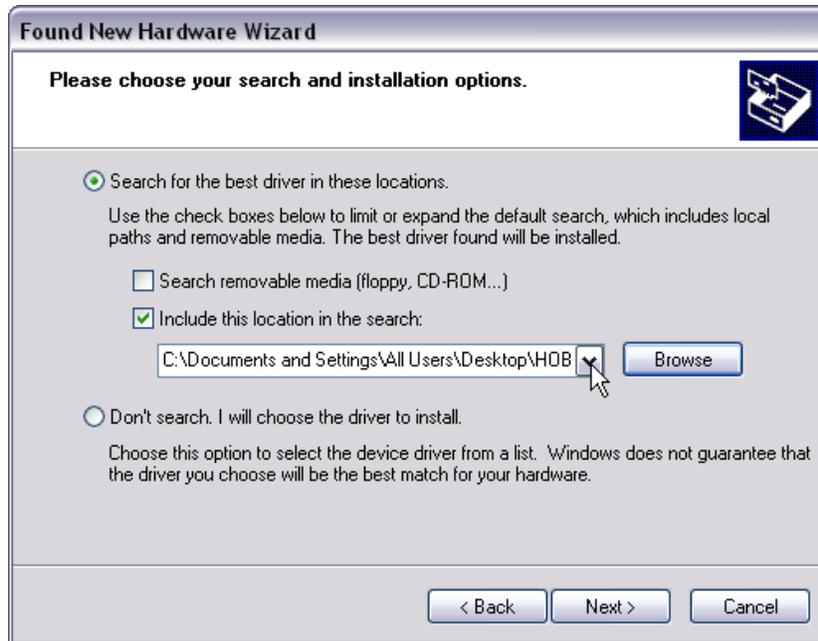
- Connect the HydroDAS to a USB port on your computer. The HydroDAS indicator light should turn green for a few seconds, then red.
- If this is the first time you have connected the HydroDAS to this computer, Windows will detect it as new hardware and attempt to find drivers automatically. If it succeeds no further action is required. If it fails, Windows XP will present you with a dialog box as shown below (see the next section for Windows 7 instructions). If it offers to connect you to Windows Update, as in the dialog box below, select “No, not this time”.



- When prompted regarding automatic installation, select the option to install from a specified location rather than automatically:



- Select the option to search for the driver, but in a location you specify. Browse to the folder “HOBİ USBLİnk Drivers” that was placed on your desktop by the installer.



- You may receive a warning that the driver has not undergone Windows “Logo testing.” However this driver is from a reputable, major manufacturer of USB integrated circuits and is safe.
- The driver should now install successfully. It is then safe to delete the folder containing the driver files from your desktop.

USB Driver Installation (Windows 7)

- Connect the HydroDAS to a USB port on your computer. The HydroDAS indicator light should turn green for a few seconds, then red.
- Windows will try to automatically install a driver, and may succeed. If it fails, proceed with the following.
- Open the Windows control panel, and from there open the Device Manager.
- Under “Other devices” you should see the item “OES USB for CFX”. Right-click on it and select Update Driver Software... from the popup menu.
- In the next dialog box, select “Browse my computer for driver software,” then browse to the folder “HOBI USBLink Drivers” that was placed on your desktop by the installer.
- You will receive a message that “Windows can’t verify the publisher of this driver software.” This is because the driver is customized for the HydroDAS and HydroDAS. Click on “Install this driver software anyway.”
- The drivers should now install successfully. It is then safe to delete the folder containing the driver files from your desktop.

4 SYSTEM OPERATION

Although the HydroDAS can support real-time operation, this system is optimized for autonomous battery-powered profiling. The instruments are controlled by a script that is in turn controlled by the external switch on the HydroDAS.

4.1 Monitoring HydroDAS operation

Although the system can operate without any connection to a computer, you can receive more information by monitoring messages sent from the HydroDAS Console port with a computer. You may find this useful during testing and setup in the laboratory, to check for proper operation in the field, and for troubleshooting.

To do this, connect the HydroDAS Power & Data Interface (PDI) cable to the 8-pin male connector on the HydroDAS. Connect the console port connector from the PDI (not the *host* port connector) to a serial port or USB-serial adapter on your computer. Using HyperTerminal or another serial terminal application, open the corresponding port with settings of 9600 baud, 8 bits, and no parity.

With your computer connected to the console port, your terminal software will display status messages when the HydroDAS initializes itself after power is applied, and then during preparation for a cast. For example, while the script is waiting for the a-Sphere to indicate that it has thermally stabilized, the HydroDAS will send periodic messages indicating how close the a-Sphere is to its temperature target. At the start of a cast, it will display the cast number and start time, and various steps in the cast initialization. Once a cast is in progress, the HydroDAS will send no further messages until the end of the cast.

4.2 Conserving Battery Capacity

Because the HydroScat-6 has internal batteries with robust capacity, the script does not supply power to it through the HydroDAS. The script only wakes it from its low-power sleep at the beginning of a cast, and puts it back to sleep at the end.

The a-Sphere consumes the largest share of current, especially when it is initially coming to thermal equilibrium. We recommend using a regulated DC power supply to provide 18 V through the PDI cable to the host port whenever the system is powered on deck. This voltage will reduce drain on the battery packs, especially when the a-Sphere is initially warming up to its standard set point, and its current consumption is at its highest. This becomes especially important if the a-Sphere must be warmed from a very cold temperature.

4.3 Deployment Procedure

Preparation for Cast

- The HydroScat-6 and a-Sphere switches should be “off”
- If the a-Sphere and CTD pumps are dry, fill them with water for lubrication.
- Start with HydroDAS switch “off” and the HydroBatts’ Y-cable unplugged from the DAS.
- If possible, supply 18V to the DAS host port through the voltage terminals on the PDI cable. This will conserve charge in the batteries.
- Plug the HydroBatt Y-cable into the 2-pin male connector on the HydroDAS
- Within a few seconds after power is applied from either the 18V supply or batteries, the light on the DAS will turn green. At this point only the DAS itself is drawing power.
- Move the switch on the HydroDAS from off to on.
- The HydroDAS light will alternate red and green, indicating the a-Sphere is powered and the HydroDAS is waiting for the a-Sphere to reach its operating temperature. Depending on the ambient temperature, this could take from 4 to 15 minutes.
- When the a-Sphere is fully stabilized, the HydroDAS light will start flashing more rapidly, indicating the system is ready to start a cast. It will wait indefinitely in this state.

Start of Cast

- To start the cast, briefly move the switch from on to off and back again to on (leave it off for less than one second). Note that you can perform this step even if the a-Sphere has not fully warmed up. Whether or not the warm-up is complete, the indicator light should then turn solid red, and the a-Sphere pump should start.
- Disconnect the 18V supply (if any) and place a dummy plug on the host port connector, then start the cast.

End of Cast

- When the package is out of the water after the cast, move the HydroDAS switch to the off position. After a few seconds the light will turn green.
- At this point all instruments are stopped, but the a-Sphere is still powered in order to maintain its internal temperature. If you expect to do another cast soon, you can leave it in this state, optionally with the 18V power applied to reduce battery consumption.
- If you do not plan another cast soon enough to justify keeping the a-Sphere warmed up, simply disconnect the batteries.

5 LOGGING SCRIPT

5.1 HydroDAS Setup Requirements

To operate as described here, the HydroDAS must have firmware version 3.31 or later, contain the file CAST.HDS in its root directory, and have the following environment variables set:

```
HOST.BAUD=115200
INISTSCRIPT=CAST.HDS
SWITCH.SCRIPT=1
SWITCH.SLEEP=0
USB.DETECT=1
```

This is the setup as delivered from HOBI Labs.

5.2 Functional Outline

The script is normally initiated by turning the HydroDAS switch on. It executes the following steps:

- Turn on the a-Sphere, and regularly query it for its warm-up status.
- Until the a-Sphere indicates it is fully warmed up, slowly flash the indicator light red and green.
- When the a-Sphere indicates it is warmed up, flash the light rapidly and wait for the switch to toggle.
- After the switch toggles, turn on the other instruments and open files to store their output data. Enter the cast start time in the CASTS.LOG file.
- Continue logging until the switch is turned off.
- Enter the cast end time in CASTS.LOG, close all the instrument files, and turn off all instruments except the a-Sphere. The a-Sphere remains powered on as long as the DAS is powered.
- A new cast can be started by turning the switch on again.

5.3 Instrument Files

For each cast, the output from each instrument is captured in a file on the DAS. The instrument files contain a copy of every byte the instrument transmits, in its native format. The CTD files also contain time tags inserted at regular intervals, since the CTD does not time-tag its own data.

Each file's name contains the cast number. For example the following files are produced by cast 5:

ASPH005.bin

HS6005.raw

CTD005.txt

GAM005.raw

ANA005.txt (data from the analog instrument port)

STAT005.txt (status messages about the DAS operation)

5.4 CASTS.LOG File

Each cast's sequence number, start time and stop time are recorded in the file CASTS.LOG. Lines are in the form:

Seq,Mon/Day/Year,Hour:Min:Sec,Mon/Day/Year,Hour:Min:Sec

For example:

1,9/13/10,13:34:10,9/13/10,13:40:15

2,9/13/10,23:50:00,9/14/10,00:10:20

5.5 Script Code

```
;-----  
; Script for UPMC DAS HD110410, Sept. 2011  
; HOBI Labs  
; Logs data from a-Sphere, HydroScat-6,  
; Gamma-4, and SBE-49 CTD  
; Each instrument's data into separate file.  
; First release version 100  
; Version 101  
;sets time of a-Sphere and Gamma-4 on every cast.  
;Does not turn off salinity on every CTD cast.  
;-----  
sendstring s 0 "Running script v101\r\n" ; strings to console  
should have \r\n for HyperTerminal
```

```
; Ports  
define consPort 0  
define aPort 1  
define aBaud 57600  
define aHost 16  
define GammaPort 2  
define GammaBaud 57600  
define GammaHost 32  
define HS6Port 3  
define HS6Baud 57600  
define HS6Host 48  
define CTDPort 4  
define CTDBaud 9600
```

```

define CTDHost 64
define AnalogPort 5
define AnalogHost 80

; Files
define aFile 1
define GammaFile 2
define HS6File 3
define CTDFile 4
define logFile 5
define AnalogFile 6
define StatusFile 7

; Misc
define green 1
define red 2
define off 0

;-----
sendstring s consPort "Turning on a-Sphere, checking for warm-
up.\r\n"
; Connect to aSphere and turn it on
openserial aPort aBaud "N81"
routeserial aPort h aHost
setpower,aPort,1
routeserial aPort s consPort

repeatuntilstring aPort "a-Sphere>" 1500
  sendstring s aPort "\r"
  waitticks 50
endrepeat
  waitticks 10
  sendstring s aPort "time "
  senddate s aPort "/" 0
  sendstring s aPort "\r"
  sendstring s aPort "power,1\r"
;Wait until aSphere says it's ready
'UNLESS the user flips the switch on-off-on
;to signal to start immediately
repeatuntilstring aPort "READY" 90000
  sendstring s aPort "warmup\r"
  sendstring s consPort "."
  waitticks 100
  settled green
  waitticks 40
  settled red
  onswitchoff startCast ;user can skip out with switch
endrepeat
;-----

;-----
; Signal that the system is ready, but wait for
; user to confirm by flipping switch
;-----
sendstring s consPort "\ra-Sphere warmed up. Waiting for
switch.\r\n"
readyForCast:
  settled green

```

```

waitticks 20
setled red
waitticks 10
onswitchoff startCast
goto readyForCast

;-----
; CAST SETUP
;-----
startCast:
  setled red
  sendstring s ConsPort "\r\nSTARTING CAST "
  sendseqnum s ConsPort
  sendstring s ConsPort " at "
  sendtime s ConsPort ":"
  sendstring s ConsPort "\r\n"

;-----
;Put starting time in cast log
appendfile logFile "Casts.log"
sendseqnum f logFile
gosub logTime
closefile logFile
;-----

;-----
; Open file for logging HDAS status
openfileseq StatusFile "Stat.txt"
gosub logStatus
;-----

;-----
; a-Sphere startup
;sendstring s consPort "Starting a-Sphere logging.\r\n"
  sendString aPort "setstart log,auto,0,,0,-1,2\r" ;send data
out serial, not log on a-Sphere
  openfileseq aFile "aSph.bin"
  sendstring h aHost "Starting file capture of a-Sphere.\r"
  routeserial aPort F aFile
;sendstring s aPort "start\r"
;-----

;-----
;Connect to HS6 and wake it (but don't turn it on-it has batteries)
sendstring s consPort "Waking HS6.\r\n"
openserial HS6Port HS6Baud "N81"
openfileseq HS6File "HS6.raw"
routeserial HS6Port FILE HS6File
repeat 4
  sendstring s HS6Port "\x03"
  waitticks 30
endrepeat
sendstring s HS6Port "power,1\r"
sendstring s HS6Port "date,"
sendDate s HS6Port
sendString s HS6Port "\r"
waitticks 50

```

```

sendstring HOST HS6Host "Starting file capture of HydroScat-6.\r"
sendstring s consPort "Opening HS6 file.\r\n"
sendstring FILE HS6File "Starting "
sendDate FILE HS6File
sendString FILE HS6File "\r\n"
;-----

;-----
;Connect to Gamma, open file, power it.
sendstring s consPort "Powering Gamma-4.\r\n"
openserial GammaPort GammaBaud "N81"
routeserial GammaPort HOST GammaHost
setpower GammaPort 1 ; power on
waitticks 200
sendstring s GammaPort "\rTime "
senddate s GammaPort "" 0
sendstring s GammaPort "\r"
sendstring s GammaPort "start /n\r" ; /n means don't log
internally
openfileseq GammaFile "Gam.raw"
sendString FILE GammaFile "Start:"
sendDate FILE GammaFile
sendString FILE GammaFile "\r\n"
sendString HOST GammaHost "Starting file capture of Gamma-4.\r"
sendString s consPort "Starting logging of Gamma-4.\r\n"
routeserial GammaPort FILE GammaFile
;-----

;-----
;Connect to CTD, open file, power it.
sendstring s consPort "Powering CTD.\r\n"
openserial CTDPort CTDBaud "N81"
routeserial CTDPort HOST CTDHost
setpower CTDPort 1 ; power on
waitticks 200
sendstring s CTDPort "outputSV=n\r"
waitticks 50
sendstring s CTDPort "startnow\r"
openfileseq CTDFile "CTD.txt"
sendString FILE CTDFile "Start:"
sendDate FILE CTDFile
sendString FILE CTDFile "\r\n"
sendString HOST CTDHost "Starting file capture of CTD.\r"
sendString s consPort "Starting logging of CTD.\r\n"
routeserial CTDPort FILE CTDFile
;-----

;-----
; Power spare port and open file
setpower AnalogPort 1
openfileseq AnalogFile "Ana.txt"
;-----

;-----
;Start HS6
sendstring s consPort "Starting HS6.\r\n"
sendstring s HS6Port "start\r"
;-----

```

```

;-----
;Turn on the a-Sphere pump
  sendstring s consPort "Starting a-Sphere logging and pump.\r\n"
  sendstring s aPort "pump 1\r"
  sendstring s aPort "start 1\r"
;-----

;-----
; Increment the sequence number for next cast
  NextSeqNum
;-----

;-----
; Loop until the user flips the switch to end
;-----
  waitticks 100      ;wait to allow switch-on
continueCast:
  sendDate FILE CTDFile "#" 20      ;insert a time tag
  gosub logStatus      ; save DAS status to file
  repeat 25
    waitticks 20
    senddate FILE AnalogFile "," 17
    sendanalog 1 FILE AnalogFile
    sendstring FILE AnalogFile "\r\n"
    onSwitchOff endCast
  endrepeat
  goto continueCast
;-----

;-----
; CAST TERMINATION
;-----
endCast:
  sendstring s consPort "ENDING CAST AT "
  sendtime s consPort ":"
  sendstring s consPort "\r\n"
  gosub logStatus
  closefile StatusFile
; leave a-Sphere powered but stop its cast and turn off pump
  sendstring s consPort "Turning off a-Sphere pump.\r\n"
  sendstring s aPort "\x03"
  waitticks 10
  sendstring s aPort "\x03"
  waitticks 10
  sendstring s aPort "\x03\rPump 0\r"
  closefile aFile
  routeserial aPort HOST aHost

; put HS6 to sleep and close its capture file
  sendstring s consPort "Putting HS6 to sleep.\r\n"
  routeSerial HS6Port h HS6Host
  sendstring s HS6Port "stop\r"
  sendstring s HS6Port "sleep\r"
  closeFile HS6File

; turn off Gamma, close its capture file
  sendstring s consPort "Stopping Gamma-4.\r\n"

```

```

sendstring s GammaPort "stop\r"
waitticks 100
routeserial GammaPort HOST GammaHost
sendString FILE GammaFile "End\r\n"
closeFile GammaFile
sendstring HOST GammaHost "Ending Gamma File Capture.\r"
setpower GammaPort 0

; turn off CTD, close its capture file
senddate FILE CTDFile "#" 20 ; insert a final time tag
sendstring s consPort "Stopping CTD.\r\n"
sendstring s CTDPort "stop\r"
waitticks 100
routeserial CTDPort HOST CTDHost
sendString FILE CTDFile "End:"
sendDate FILE CTDFile
sendString FILE CTDFile "\r\n"
closefile CTDFile
sendstring HOST CTDHost "Ending CTD File Capture.\r"
setpower CTDPort 0

; turn off Analog, close its capture file
closefile AnalogFile
setpower AnalogPort 0

; put ending time in cast log
appendfile logFile "Casts.log"
gosub logTime
sendstring f logFile, "\r\n"
closefile logFile
endscript

logTime:
sendstring FILE logFile, ","
senddate FILE logFile, "/", 2
sendstring FILE logFile, ","
sendtime FILE logFile, ":"
return

logStatus: ; store a line of status information to the status
file
sendDate FILE StatusFile, "/", 2
sendstring FILE StatusFile, ","
sendtime FILE StatusFile, ":"
sendstring FILE StatusFile, ","
sendstatus FILE StatusFile ; no line terminator needed, status
has /r/n already
return

```

6 INSTRUMENT PARAMETERS

6.1 a-Sphere, Port 1

Communication Parameters

57600 baud, no parity, 8 data bits, 1 stop bit

To ensure the a-Sphere is set to 57600 baud, connect to it using its own PDI cable and a-Sphere console software. In the terminal, send the command: BAUD,57600,store (followed by the return key).

Time tagging

Instrument has real-time clock, synchronized to HydroDAS by script.

Sample parameters

a-Sphere sets its own data pace

Power

Power is supplied by HydroDAS

During a-Sphere warm-up time, can supply external power through PDI cable to save battery pack power

6.2 Gamma-4, Port 2

Communication Parameters

57600 baud, no parity, 8 data bits, 1 stop bit

Time tagging

Instrument has real-time clock, synchronized to HydroDAS by script.

Sample parameters

Gamma-4 samples at a rate determined by its internal settings. To change settings, send commands through a terminal, or through HydroSoft.

Power

Power is supplied by HydroDAS.

6.3 HydroScat-6, Port 3

Communication Parameters

57600 baud, no parity, 8 data bits, 1 stop bit

Time tagging

Instrument has real-time clock, synchronized to HydroDAS by script.

Sample parameters

HydroScat-6 samples at a rate determined by its internal settings. To change settings, send commands through a terminal, or through HydroSoft.

Power

Power is supplied by HydroScat-6's internal rechargeable batteries. Charge the batteries after 10 to 20 hours of operation.

6.4 CTD, Port 4

Communication Parameters

9600 baud, no parity, 8 data bits, 1 stop bit

Time tagging

Instrument has no clock. Script inserts time tags in the data stream.

Sample parameters

The CTD samples at a rate determined by its internal settings. Use a terminal or Seabird software to change the settings.

Power

Power is supplied by HydroDAS

6.5 c-Star or other analog sensor, Port 5

Communication Parameters

Analog input, digitized in volts.

Time tagging

Time tags are inserted by the script.

Sample parameters

The script samples the sensor once per second.

Power

Power is supplied by HydroDAS