AcSense-8CH-OEM User Manual

Erin Fischell, PhD
Acbotics Research, LLC
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Questions? Contact: efischell@acbotics.com

System Overview

System Description	AcSense-8CH-OEM
Voltage into AcSense-Digital	3.7V-17V
Communication protocol	UDP ethernet, serial console
Logging	MicroSD card
Channels	Up to 8
Sample rate	52734 S/s/channel nominal, synchronous
Bit depth	16 bit
Gain	+/-1 V
Analog Filtering (Antialiasing)	10Hz-24kHz Nominal

The AcSense-8CH-OEM is the OEM version of AcSense logging or streaming system with up to 8 hydrophone inputs, on-board IMU, internal pressure/temperature, and external RTC for use in underwater sensing applications. Based on the AcSense-ADM Analog and Digital boards, this system provides 8 channels of 16 bit synchronous data acquisition at 52734 Hz with a number of options for secondary analog and digital data acquisition or streaming.

Acbotics PN	Description	Notes
100056	AcSense-Digital-OEM, Europe Manufacture	
100053	AcSense-ADM-OEM, Europe Manufacture	
100102	AcSense-IB-CM	For 6 channel systems, capacitor board suggested if power noise is an issue

Input Voltage:

Connector Number	Cable End Description	Voltage (VDC_
J1	USBC	5 V
J22	Molex Microfit 3.0 1x2 M shell F pins	3.7 to 17 V

Console: A console cable is provided; see console section below.

SD Card: The system is configured via a file called DefaultConfig.cfg on the SD card. We provide a micro SD card with a default configuration, with that same config available in the customer share google drive. <mark>NOTE FOR LOGGING SYSTEMS: Micron microSD cards are the only ones we have identified that meet IO latency requirements for high rate, multi-channel acoustic logging. Use other cards at your own risk!</mark>
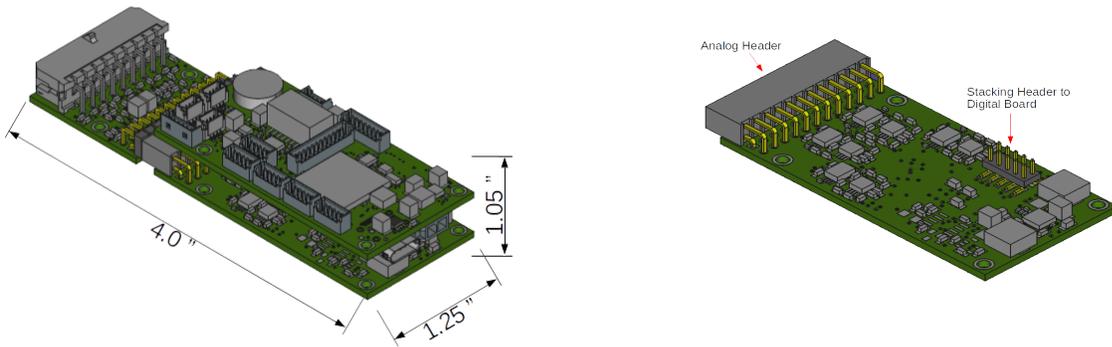
System Overview

FIG 1: AcSense-8CH-OEM stack consists of AcSense-Digital, AcSense-ADM, and AcSense-IB boards. AcSense-ADM shown to the Right.
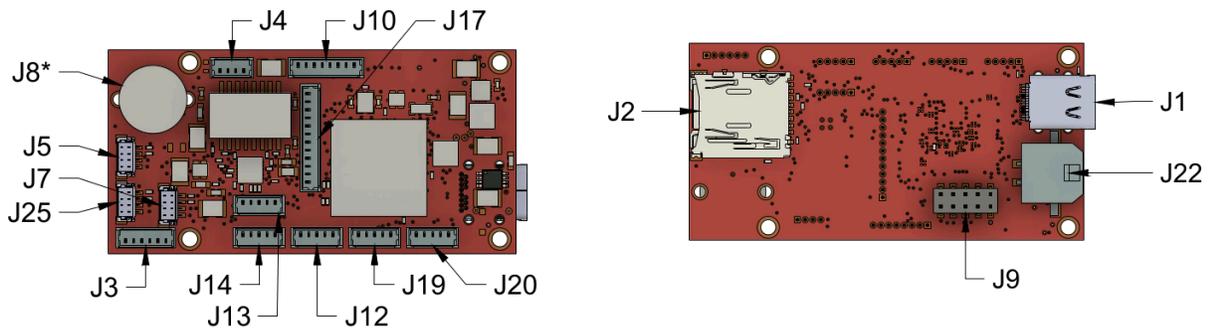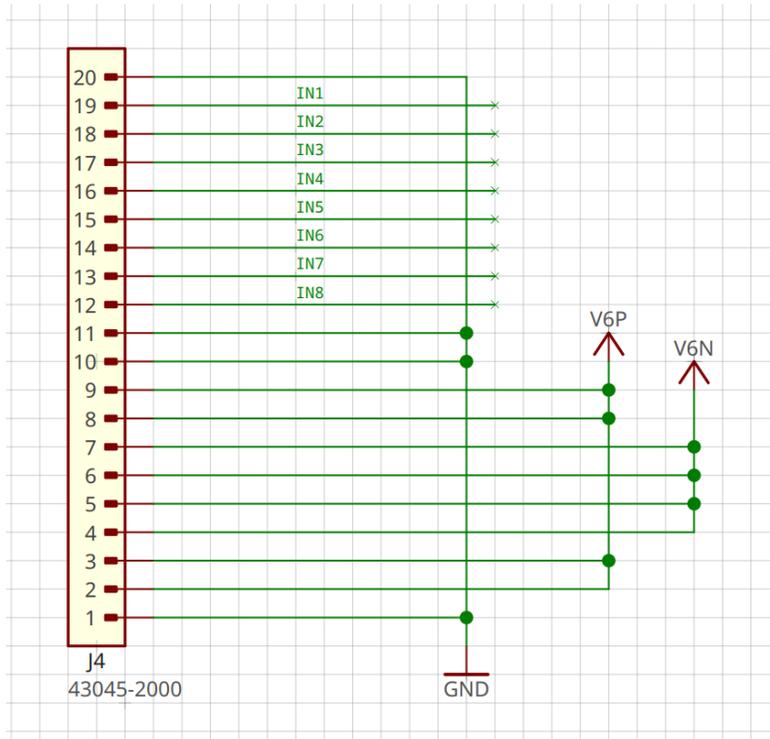

FIG 2: Digital Board connector Labels. For this build, important connectors are J17 -> Analog board, J20 -> Console Cable, J12 -> Status LED, J7 -> RTC, J1 (USBC) or J22 can be used to power the system with 5-17 V, Micro SD card slots into J2, Ethernet connects into J4. J9 stacks with AcSense-ADM board.

AcSense-IB-CM Connect: INT (Microfit 3.0 2 x 9 connector, male shell female pins)		
Microfit 3.0 2x9 connector pin	Descrption	Hydrophone Array (HTI-96-MIN element and color)
18	CH0 IN	H0 Green
17	CH1 IN	H1 Green
16	CH2 IN	H2 Green
15	CH3 IN	H3 Green
5	12 V (common for array)	Common Red
14	CH4 IN	H4 Green
13	CH5 IN	H5 Green
12	CH6 IN	H6 Green
11	CH7 IN	H7 Green

Pinout: Microfit 3.0 2x9 Connector for hydrophone array into AcSense-IB-CM

Typical Use: Streaming And Logging

The typical use of this system includes turning the system on, configuring the system, confirming system state, and data offload. The system on startup will begin streaming over ethernet or logging to an SD card automatically based on configuration.

Powering On

To power the system on, power via one of the power connectors:

Connector Number	Cable End Description	Voltage (VDC_

J1	USBC	5 V
J22	Molex Microfit 3.0 1x2 M shell F pins	3.7 to 17 V

Observing System State

There are two LEDS in a typical system, one on the RTC that is plugged into J7 and the other a cabled status LED plugged into J12. The green RTC LED will be on so long as the system is powered; the green status LED has three states:

- OFF: AcSense system is not running/logging data
- AcSense is logging but not logging: solid LED
- Recording: flashing LED, 2 s on, blink off, 2 s on

If the light is ON but not blinking, that indicates the system is configured but the SD card is missing. If the light is OFF it indicates the AcSense is not running. Check that the SD card is fully inserted; this can also indicate that the config file contains an error. Open the config file in ghex and ensure each config line starts at the beginning of the line.
For streaming systems, there is also a green LED next to the Ethernet that flashes indicating data is being transfered.

Logged data Parser and Plotter

Parsing and plotting is handled via an open-source GUI provided by Acbotics Research. For the most up to date public repo and use instructions, see:
https://github.com/Acbotics-Public/AcSense_utils.git

A data guide for the parsed data is available here:
https://drive.google.com/file/d/1k2rgcVA0x1bnQhvOWNxrLuEduuJwRQs8/view?usp=drive_link

Streamed Data: ROS Application

The ROS application for ethernet streaming is available open-source; for the most up to date public repo and use instructions, see:
https://github.com/Acbotics-Public/AcSense_ROS.git

Streamed Data: UDP Interface

Open source UDP interface code is available here:
https://github.com/Acbotics-Public/acbotics_interface.git

UDP documentation available here:
https://drive.google.com/file/d/1ezCYTqTsJve-yFn82GkBIWZWaMDw6pX9/view?usp=drive_link

FTP

FTP mode may be entered via the console for data offload; it is relatively slow, but valuable for copying configuration files via ethernet from inside a pressure housing. See FTP documentation for more information:
https://drive.google.com/file/d/1wiiJTJ3Ew9l3Jjj6feX_LDTSdJh_Wv-4/view?usp=drive_link

microSD Card Config

The provided microSD card should have a file called "DefaultConfig.cfg". This file sets which data streams are turned on and off, what is logged, and what is used as the clock for the system. Your system's microSD card and your customer share will include the config file we think you need, but you can modify as needed. Full system configuration documentation is available here:
https://drive.google.com/file/d/1SIimxnDBgkRI-0ZcZRoyej0T_7yiOJox/view?usp=drive_link

To change the default config, do the following:

1. Locate and remove SD card. Plug into computer.

2. Find binary .cfg file on SD card, DefaultConfig.cfg

‹ › 🖫 128 GB Volume ▾		🔍 ⊞ ▾ ☰ — ▢ ✕
🕐 Recent	Name ▾	Size	Modified
	🔳 CurCfg.cfg	16.4 kB	08:37
★ Starred	🔳 DefaultConfig.cfg	16.4 kB	Yesterday

3. Open file in ghex or other binary file editor. (instructions below are for ghex) (for ghex, it is really helpful to stretch the screen horizontally until the lines all start where the hex ends as shown below before attempting to edit)
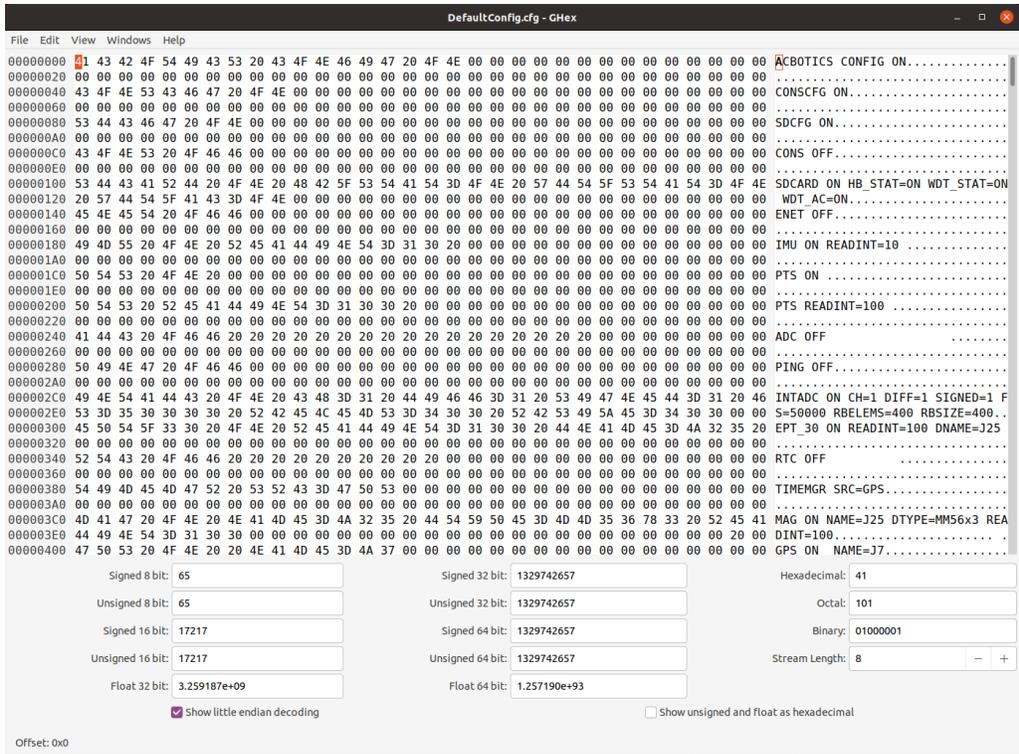
4. Edit as needed
5. Save file
6. Eject card, put back into AcSense-Digital board

Install ghex on linux:
> sudo apt-get install ghex

For more information on config file customization, see **Configuration Setup.**
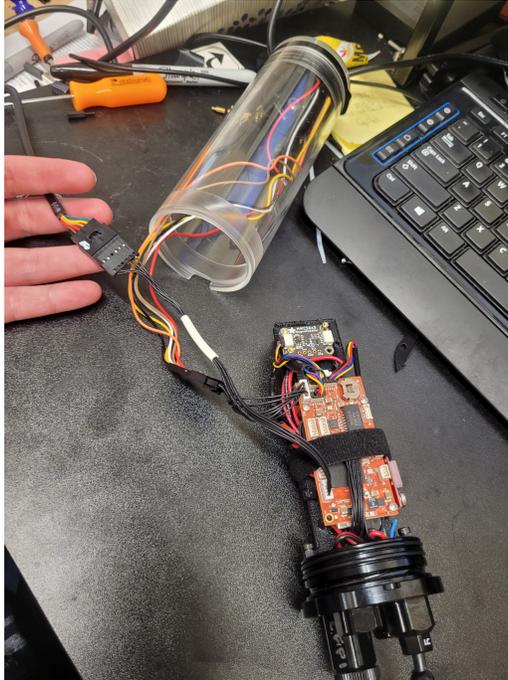
Serial Console

Full serial console documentation available here:
https://drive.google.com/file/d/1FH1gXtW7tc9-Erbu8n4taJlVuCTINEX0/view?usp=drive_link

Serial console

The cable kit includes a console cable to plug into J20; this cable mates to a USB to serial converter (avail on digikey:
https://www.digikey.com/en/products/detail/ftdi-future-technology-devices-international-ltd/TTL-232R-3V3/1836393). Using a console is useful if you need to debug the system, but may not be required during general use.

Plugging in the console cable to the AcSense-Mini-Cam system

1. Connect console cable to USB to serial converter cable (provided)
2. Power on
3. Log in via Minicom or other terminal (Baud rate 115200, flow control off):
   > minicom -D /dev/ttyUSB0
   (Navigate menus to adjust baud rate, flow control)
4. Activate serial console and heartbeat:
   ➔ ?
   ➔ LOG+
   (The system should begin giving you heartbeats)

   NOTE: if you query too soon after startup, you will get a message "Password?". If that happens, unpower/power the unit and try again with a longer wait.
5. Query the GPS:
   ➔ GPS
6. If the RTC on the GPS is correct, continue to step 8
7. To manually set the RTC:
   ➔ > ?
   ➔ > CFG
   ➔ >> RTC
   ➔ >> RTC MM/DD/YY HH:MM:SS
   ➔ >> EXIT
   ➔ To confirm: (it may take a few seconds to update)
   ➔ > RTC
8. Verify sensor values using serial console:
   ➔ ?

➔ LOG+

The system will begin giving you heartbeats. To view IMU data:

➔ IMU+

To observe IMU settings:

➔ IMU PRT

To get IMU at a rate of 1 sample every 10 ms:

➔ IMU READINT=10

To slow back down to every second:

➔ IMU READINT=1000

(READINT is set in ms)

To stop streaming IMU over serial console or to get a single data entry:

➔ IMU

9. Verify data is logging:
➔ ?
➔ SDCARD

SDCARD Space: 29.711GB, Free: 29.677GB, Ovfl: 0, Next: D2/AC2_2.dat
SDCARD Sensor File: D2/SENS_2_1.dat, size: 0.582MB

Repeat the command, and observe if the file size is growing (it should be, indicating logging is indeed taking place.

In general, a command and + will stream; a command without plus will give a single return and stop. Examples for data queries are:

LOG   STS   CFG   PING   RTC
PTS   IMU   SDCARD EPT GPS MAG