

# **1. INTRODUCTION**

Quartz pressure/temperature transducers are widely used in the oil industry for measuring downhole pressure and temperature with very high accuracy. Quartzdyne (www.quartzdyne.com) is the leading manufacturer of quartz transducers, of which there are two types: traditional Frequency Output Transducers (sometimes referred to as analog) and the more recent Digital Transducers, which are accessed via an I<sup>2</sup>C interface.

Quartzdyne manufactures a device called Q-Link, which reads pressure and temperature values of up to 4 digital transducers. The data can be displayed on a PC using Quartzdyne's QConsole software. Q-Link only supports digital transducers with I<sup>2</sup>C interface. Frequency output transducers are not directly supported by Q-Link.

The AVA-08 Frequency Transducer to Q-Link Interface fills this gap. It connects between a Q-Link device and up to 4 frequency output transducers. It measures pressure and temperature frequencies and makes them available to Q-Link via I<sup>2</sup>C. The AVA-08 appears to Q-Link as a set of digital transducers.

Q-Link only provides a 3V transducer supply. The AVA-08 therefore includes step-up circuitry that generates a 5V supply, so that any frequency output transducer can be connected, including legacy types that would not work below 5V.



Figure 1: AVA-08 and Q-Link side by side.



# 2. CONNECTIONS

The AVA-08 contains 4 electrically independent channels. It connects to the Q-Link device via 6-pin Mini-Din cables (male-male), one cable for each channel. If a channel is not in use (no transducer connected), its cable should be unplugged from the Q-Link device.

The cables should not be longer than 2m and of good quality (ideally shielded). Beware of cheap PS-2 cables, which may not have all of the pins wired through (mice and keyboards only require 4 wires).

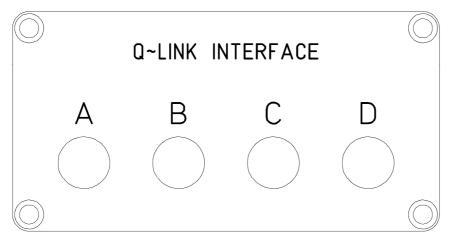


Figure 2: AVA-08 Rear Panel with 6-pin Mini-Din Sockets.

Frequency transducers are connected via 9-way D-Type connectors. The pin-out is printed onto the front panel and follows the standard Avanti simulator pin-out for frequency transducers. Note that Quartzdyne transducer cables that are terminated with a D-type plug have a different pinout.

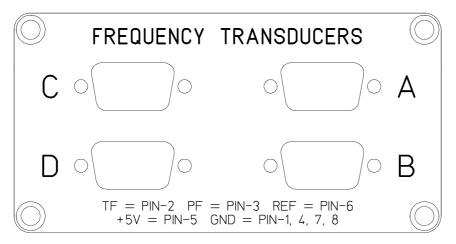


Figure 3: AVA-08 Front Panel with 9-way D-Type sockets.



# **3. I<sup>2</sup>C INTERFACE**

The AVA-08 is based on AVA-07 frequency counters. These counters provide an I<sup>2</sup>C interface, which is compatible but not identical to the I<sup>2</sup>C implementation in a Digital Quartzdyne Transducer. The AVA-08 therefore has the same I<sup>2</sup>C restrictions as the AVA-07. For details see the AVA-07 user manual.

These I<sup>2</sup>C restrictions however do not pose a problem when connected to a Q-Link device. The AVA-08 has been proven to be fully functional with the latest Q-Link firmware revision (REV\_A5) and QConsole software revision (V2.8).

### 4. CALIBRATION COEFFICIENTS

The AVA-08 is preloaded with dummy coefficients, which report the transducer model as AVANTI and the serial number as AAAAAAAA, BBBBBBBB, CCCCCCCC or DDDDDDDD depending on the channel (A, B, C or D) being used. The preloaded dummy coefficients translate frequencies 1:1 into psi and °C, e.g. a pressure frequency of 20000Hz will be displayed as 20000psi in QConsole and a temperature frequency of 30000Hz will be displayed as 30000°C.

The dummy coefficients are read from the AVA-08 EEPROM after Q-Link is powered up. They allow a quick check of pressure and temperature frequencies and remain active until proper calibration coefficients are loaded from file.

Q-Link only handles coefficients in digital format, i.e. in the form of a .HEX file. Coefficients for frequency transducers are normally supplied in a different format in the form of two separate files, a .CRF file for pressure coefficients and a .CRT file for temperature coefficients.

A conversion utility CFFconv is available from Avanti, which extracts the information contained in .CRF/.CRT files and generates a .HEX file for use with Q-Link. This is a simple one-click operation. The CFFconv software utility can be downloaded from www.avanti.clara.net/cffconv.zip

Note that the preloaded dummy coefficients are write protected. It is therefore not possible to permanently alter these coefficients in QConsole, unless the enclosure is opened and a jumper link is removed (see below).

## **5. INTERNAL JUMPER LINKS**

There are two internal jumper links contained in the AVA-08.

One of the jumper links controls the write protection of the internal EEPROM. If the jumper is inserted, the EEPROM is write protected, if the jumper is removed, the EEPROM contents can be altered. The AVA-08 is shipped with the jumper inserted.

The second jumper link controls the counting mode. If the jumper is removed, the counters count over a period of 1sec with updates every 91ms. If the jumper is inserted, the counting period follows the polling rate and adjusts itself between 91ms and 2.8sec. The



91ms update rate remains unaffected. The AVA-08 is shipped with the jumper removed, i.e. with a fixed counting period of 1sec. For further details see the AVA-07 user manual.

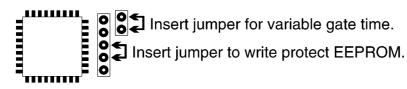


Figure 4: Location of AVA-08 Jumper Links

To open the enclosure, it is recommended to unscrew the panel with the D-Type connectors and then to slide out the complete assembly.

### 6. Q-LINK POWER SUPPLY

The Q-Link device contains four linear 3V regulators, one for each channel. These regulators are very small and can therefore dissipate only a limited amount of heat. The current drawn by the AVA-08 from the 3V supply is approximately 30mA, including a typical frequency output transducer. This is significantly more than a digital transducer would draw, due to stepping up the transducer supply to 5V.

It is therefore essential to power the Q-Link device from a regulated power supply not exceeding 5V max. Q-Link works with input voltages as low as 3.3V. A regulated 3.3V PSU is therefore recommended.

Caution: Always power down Q-Link while connecting/disconnecting transducers.

#### 7. OPERATION STEP BY STEP

a) Make sure power is removed from Q-Link. Connect 1...4 transducers to the AVA-08 interface. Connect a Mini-Din cable for each channel in use and plug the other end into the Q-Link device. Connect the Q-Link device to the serial port of a PC. Then apply power.

b) Start QConsole software and register all connected transducers by pressing CONNECT. QConsole will display a screen as shown below. Note the Model Number AVANTI and the serial number AAAAAAAA, indicating that dummy coefficients are used, which were read from the AVA-08 EEPROM.



Using C:\Program Files\Quartzdyne\QConsole.ini Connect			
nts Update QLink Software PC Capture			
Transducer Information			
Firmware Version: Ver 1.50 03/03/06 (c) 2003	QUARTZDYNE, Inc.		
🔟 GateTime: 1.00	Model Number: AVANTI		
Clock Time: 08/Apr/10 07:58:05	Serial Number: AAAAAAAA		
🗵 Pressure Units: 🏾 psi	FPGA Version: 0D020302		
Temperature Units: C			
	Data Precision: 3		
Ver 2.8 27.03.2007 © 2006 QUARTZDYNE, Inc.			
Command #01	l Line		
Press Counts Temp Counts	Pressure 🔊 Temperature * 🗘		
17895692 11930465	29999.992 20000.000		
500 -> []			
	nts Update QLink Software PC Capture Transducer Information Firmware Version: Ver 1.50 03/03/06 (c) 2003 GateTime: 1.00 Clock Time: 08/Apr/10 07:58:05 Pressure Units: psi Temperature Units: C Ver 2.8 23 Ver 2.8 23 Command #01 Response		

c) If the READINGS tab is pressed, all connected transducers are displayed as shown below. Due to the dummy coefficients loaded from EEPROM, psi and °C values indicate pressure and temperature frequencies in Hz instead of true pressure and temperature.

🖉 Quartzdyne QConsole				
Help				
Using C:\Program Files\Quartzdyne\QConsole.ini Connect				
EZCommands Readings Coefficients Up	date QLink Software 🛛	PC Capture		
#01 AAAAAAA				
Time	Press Counts	Temp Counts	Pressure pai	Temperature *C
08/Apr/10 08:00:38	17895698	11930461	30000.001	19999.994
#02 BBBBBBB				
Time	Press Counts	Temp Counts	Pressure ps/	Temperature *C
08/Apr/10 08:00:39	29826162	23860930	50000.000	40000.000
NoConnect				
Time	Press Counts	Temp Counts	Pressure	Temperature *
NoConnect				
Time	Press Counts	Temp Counts	Pressure	Temperature *
	Stop -> [			



d) In order to get real pressure and temperature values, valid coefficients must be loaded from a .HEX file. If not already done, use Avanti's CFFconv utility to generate a .HEX file from .CRF/.CRT files. Then open the .HEX file from the COEFFICIENTS tab.

Öffnen					? ×
<u>S</u> uchen in:	CFFtest		•	🗕 🖻 💣 🎟	
Zuletzt verwendete D Desktop	া 157996.HEX ☑ 184640.HEX				
Eigene Dateien					
Arbeitsplatz					
Netzwerkumgeb ung	Datei <u>n</u> ame:	184640.HEX		•	<u> </u>
	Datei <u>t</u> yp:	QLink Coef		•	Abbrechen

sing C:\Program Files\Quartzdyne\QConsole.ini		Connect
2Commands Readings Coefficients Updat Coefficients -22911641 2631851 92979626 -49229310 18782427 -2844734 -11108525 12974454 -5704337 926512 1159339 -1449760 662648 -109923 Cal Type: 2 Prescale: 3 N1: 0 N2: 3 S1: 0x39800000 S2: 0x39E66666 OFS2: 72817 1133175 -467117 80922 -63796	Hex File : 10000000000010123000 : 100020080121000 : 10002008782366000 : 10003000FBA26567002 : 10004000011B38DBFFT : 100050000000000000 : 1000600000000000000 : 10008000000000000000 : 1000B00000000000000 : 1000B0000000000000000 : 1000B000000000000000000000000000000000	1846405148423130382D3141 10052301030303398000009B 0000007A5D407303D4D24874 2828AB058AC1AAFD10D2027B 0497C2FF567F5300C5F97697 0523300011B0ABFFE9B0B020 FE529D00000000000000000000 0000000000000000



e) Then press LOAD COEFFICIENTS to copy the coefficients into Q-Link. Untick the MAKE CHANGES PERMANENT box, since the EEPROM of the AVA-08 is write protected and cannot be changed permanently.

	×
Make Change Permanent	
Ok	

f) Go back to the EZCommands tab and select the next transducer's address.

Address	×	
<ul> <li>Display data from another device.</li> <li>Change address of current device.</li> </ul>		
C Reconnect using another address.		
Address -> #02		
OK Cancel		

g) Repeat loading coefficients from file (steps d and e) until all connected transducers are done.

h) Go back to the READINGS tab and press again CONNECT until all transducers are reregistered and the coefficients loaded from file come into effect.

God	od Conection Found
	A connection has been found at:
	9600 BR
	COM1
	#02
	OK - STOP Searching Search For More



i) The READINGS screen now shows correct psi and °C values of all transducers together with their correct serial numbers.

🖉 Quartzdyne QConsole				_ <b>_ _</b> ×
Help				
Using C:\Program Files\Quartzdyne\QConsole	.ini			Connect
EZCommands Readings Coefficients Up	date QLink Software 🛛	PC Capture		
r#01 0D184640				
#01 00184840				
Time	Press Counts	Temp Counts	Pressure AN	Temperature ${}^*\mathcal{L}$
08/Apr/10_08:08:18	17895692	11930465	1676.016	199.947
#02 0D157996	<u></u>	·	r	
#02 0D157996				1
Time	Press Counts	Temp Counts	Pressure pw	Temperature ${}^*\mathcal{L}$
08/Apr/10_08:08:19	29826162	23860930	12982.772	114.003
NoConnect				
Time	Press Counts	Temp Counts	Pressure	Temperature *
<u> </u>				
NoConnect				
Time	Press Counts	Temp Counts	Pressure	Temperature *
<u>L</u>				
	Stop ->			

## 8. SPECIFICATION

Supply Voltage	3.0V from Q-Link device
Supply Current (including transducer)	Approximately 30mA,
	>60mA briefly on startup
Counting Reference	$F_{REF}/2 = 3.6MHz$
Update Rate	91ms
Gate Time	91ms – 2821ms (MODE link inserted)
	1001ms (MODE link removed)
Dimensions / Weight	105 x 125 x 55mm / 370gr

For resolution values versus gate time see the AVA-07 user manual.

## 9. CAUTION

- Always power down Q-Link while connecting or disconnecting transducers.
- Double check the transducer wiring before powering up.
- Connect only channels that are in use (i.e. with a transducer connected) to Q-Link.
- Keep the wiring at the D-Type connectors as short as possible.
- Keep the length of the Mini-Din cables below 2 meters.



#### **10. ACKNOWLEDGEMENTS AND FURTHER INFORMATION**

Quartzdyne is a trademark of Quartzdyne Inc.

Information on their range of pressure transducers and the Q-Link device can be downloaded from their web-site at http://www.quartzdyne.com

I<sup>2</sup>C is a trademark of NXP Semiconductors (formerly Philips).

Specifications and application notes can be downloaded from their web-site at http://www.nxp.com

Avanti Part Number:

AVA-08

Avanti Serial Number: 0001

Tested: