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Tool Code: QPS019  
Document: MN-QPS019-E  
**Quartz Pressure Tool**

# PRODUCTION LOGGING

## Quartz Pressure, Single Sensor Tool

**QPS019: 1<sup>11</sup>/<sub>16</sub>" , Ultrawire™**

**Operational And Maintenance Manual**

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## 0 ABOUT THIS MANUAL

### 0.1 MANUAL HISTORY

Date	Issue	Description	Auth	Chk	App
24/05/99	B	QPS manuals created for each memory tool			
07/11/00	C	New templates used			
20/11/00	D	Manual created for QPS019 Ultrawire tool	RH/DO		RH
04/06/04	E	ECR1577: drawing updates for manufacturing	DO	SA	RH
16/08/04	A	QPS020 IBUS manual created.	JB/DO	(SA)	(RH)

### 0.2 UPDATES TO BE USED WITH THIS MANUAL

Date <sup>a</sup>	Update	Description
05/02/05	<i>MUD-0501</i>	Only applicable if Ultrawire Telemetry Board PCB82226 has been replaced with PCB82270.

<sup>a</sup>. Note: this chapter shall be updated to include information on manual updates to be used with this manual, irrespective of current manual issue.

### 0.3 TECHNICAL HELP

For further technical help contact Sondex as follows:

Address: Ford Lane, Bramshill, Hook, Hampshire, RG27 0RH, UK  
 Telephone: +44(0)118 932 6755  
 Fax: +44(0)118 932 6704  
 Email: [support@sondex.co.uk](mailto:support@sondex.co.uk)

### 0.4 FEEDBACK

Please help us to improve future issues of this manual by sending comments or corrections to Sondex as above.

In your feedback please make reference to:

- The manual title, version and section
- Misprints, errors or unclear explanations
- General comments and suggestions.

Thank you.

Quartzdyne® is a registered trademark of Quartzdyne Inc. For details see [www.quartzdyne.com](http://www.quartzdyne.com).

**Photographs and sketches are for illustration purposes only. Depending on the tool model that you have, certain features or dimensions may differ from those shown.**

## 1 EQUIPMENT

### 1.1 DESCRIPTION

The Sondex Quartz Pressure Tool measures pressure and gauge temperature using an industry standard precision quartz crystal pressure transducer.

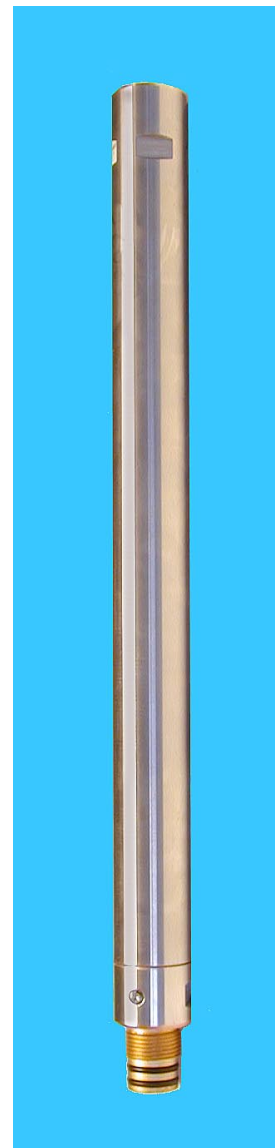
A Quartzdyne QU pressure gauge, with removable bellows to isolate the quartz crystal from well fluids, is fitted to the lower tool body. An open pressure port with wire mesh filter allows well pressure into the gauge. A second (flushing) port is plugged whilst running in hole.

**The bellows must not be unscrewed from the gauge otherwise the calibration will be invalid.**

The electronics interfaces to the Ultrawire™ toolbus telemetry. The single conductor passing through the tool carries telemetry and power.

### 1.2 PURPOSE

- To provide a continuous log of borehole fluid pressure;
- To provide a record of reservoir pressure draw-down and build-up data during flowing tests.



QPS019

**1.3 SPECIFICATION**

<b>Parameter</b>	<b>Specification</b>	<b>Remarks</b>
Temperature (max)	177°C (350°F)	
Pressure (max)	15,000 psi	
Diameter	1 <sup>11</sup> / <sub>16</sub> " (43mm)	
Make-Up Length	19.01" (482mm)	Toolstring length
Measure Point	2.9" (74mm)	Above lower tool joint
Weight in air	4.0kg (8.8lbs)	
Operating voltage:		
Nominal:	13-18V	
Max:	24V	
Current consumption at 12V	20mA	
End threads (top/bottom)	1 <sup>3</sup> / <sub>16</sub> " UNF (female/male)	
End connectors (top/bottom)	4mm single connector (pin/socket)	
Well Port thread	1/ <sub>16</sub> NPT	
<b>QUARTZDYNE QU-16K-B</b>		
Pressure:		
Max total/combined error	0.02% FS	
Resolution	0.008psi	Depends on acquisition parameters
Response Time	<1 sec for 99.5%	
Ageing	< 3psi/year	
Temperature:		
Accuracy	0.15°C typical	
Resolution	<0.005°C	Depends on acquisition parameters
Ageing	<0.16°C/year	
Reference Clock:		
Ageing	<2ppm/year	

## 2 SAFETY



**Warning!** **HOT WORK!** Sondex equipment may, under certain circumstances or failure modes, become a potential source of ignition. Using it must therefore be considered "**HOT WORK**" and appropriate precautionary procedures should be followed when testing at surface in areas where there is a risk of gas leaks or other potentially explosive atmospheres.

### 2.1 EYE IRRITANT



Silicone (Dow Corning 200 or equivalent) pressure fluid is used inside the transducer housing to protect the crystal from contact with well fluid. **This is a potential eye irritant.** If fluid comes into contact with the eyes, flush with copious quantities of water for 15 minutes, and visit a doctor as soon as possible.

### 2.2 TRANSDUCER PROTECTION

The Quartzdyne gauge should not normally be removed from the pressure port sub, since this seal is maintenance free.

The bellows must not be unscrewed from the gauge otherwise the calibration will be invalid.

The Quartzdyne gauge is hard wired to the QPS electronics. Care is required during maintenance since incorrect application of power to the gauge may cause damage.

The pressure transducer is a quartz crystal. The crystal will not be vibration-damaged under normal well logging conditions, but high frequency (i.e. metal to metal) shock perpendicular to the axis of the QPS should be avoided.

### 2.3 DEADWEIGHT TESTING



**Warning!** Only qualified personnel should apply dead-weight testers to the pressure port, see [Section 7.2 Pressure Calibration](#). Use adequate precautions against excessive pressure. In a lab environment, limit test pressures to 10,000 psi *and allow no bystanders*. Precautions are required to allow for high pressure blow out through the flushing port in the event of failure.

### 2.4 POST LOGGING TRAPPED PRESSURE

Beware internally trapped pressure when removing pressure housing or lower connector circlip (item 6, 09509).

### 3 THEORY OF OPERATION

#### 3.1 DESCRIPTION

A Quartzdyne QU type quartz pressure gauge is screwed and sealed with a compressable metal 'olive' seal into a Housing sub which has ports to the outside to allow well pressure into the gauge.

Electronics interfaces the sensor signals to the single conductor Sondex Ultrawire™ toolbus.

#### 3.2 SENSOR OPERATION

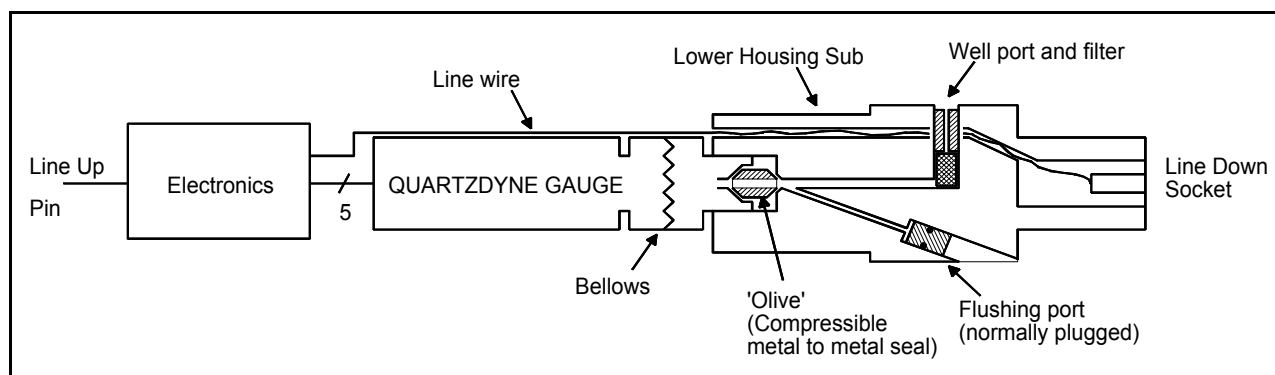


Figure 3.1 QPS Simplified Tool Diagram

#### Quartz Pressure Sensor

Pressure enters through the well port in the Lower Housing sub and acts on the gauge bellows which is filled with silicone oil during manufacture. The bellows therefore isolates the quartz pressure crystal from the aggressive well fluids while transmitting the pressure.

Note that the bellows may introduce error at atmospheric pressure.

A second "flushing" port, blocked off while logging, allows the well port to be flushed clean during maintenance.

The crystal resonance frequency depends on pressure and temperature, hence the gauge incorporates a second "temperature" crystal, thermally coupled to the first which is not subjected to well pressure. A 7.2MHz clock, used to down shift the pressure and temperature crystal frequencies is output as a time reference for frequency measurement. Drift of this clock is included in the calibration algorithm, resulting in accurate calculation of Temperature and Pressure. Gauge output pressure and temperature frequencies lie in the range 15-60kHz, see [Figure 3.2](#) and [Figure 3.3](#).

#### 3.3 ULTRAWIRE TELEMETRY CIRCUIT

This interfaces to the +18V single wire telemetry, providing +12V and +5V for tool power. Pressure, Temperature and Reference clock frequencies are counted and transmitted in Ultrawire data format over the toolbus in response to requests from the Telemetry Controller eg MPL, XTU or other Crossover. Various commands are supported in the protocol.

3.4 PRESSURE DETERMINATION: TYPICAL TOOL RESPONSE

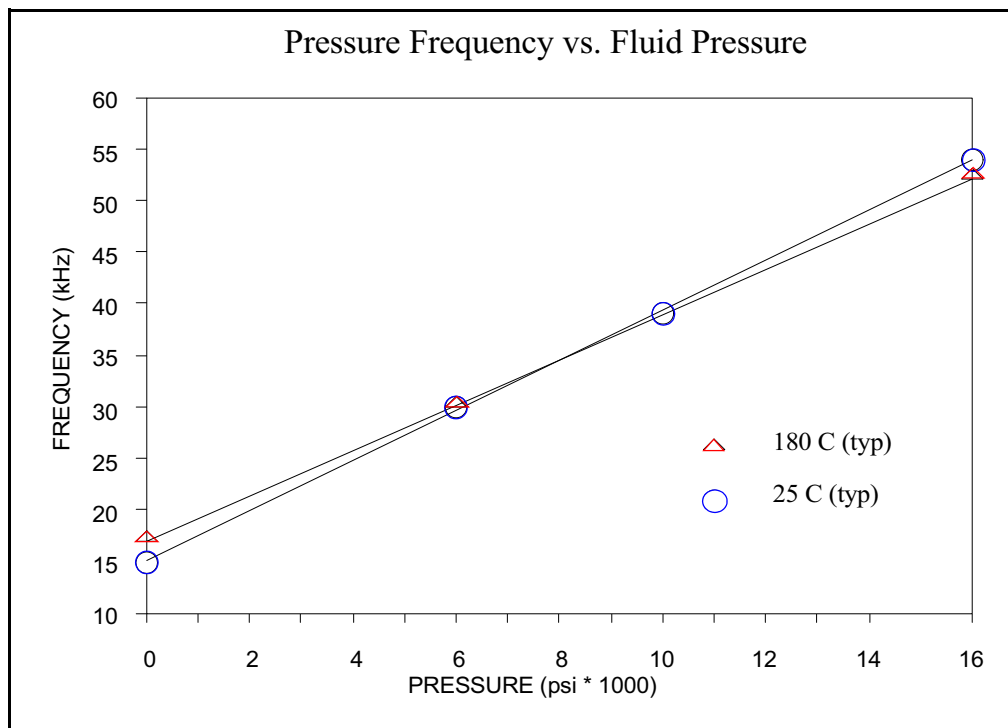


Figure 3.2 - Typical Frequency vs. Pressure Response

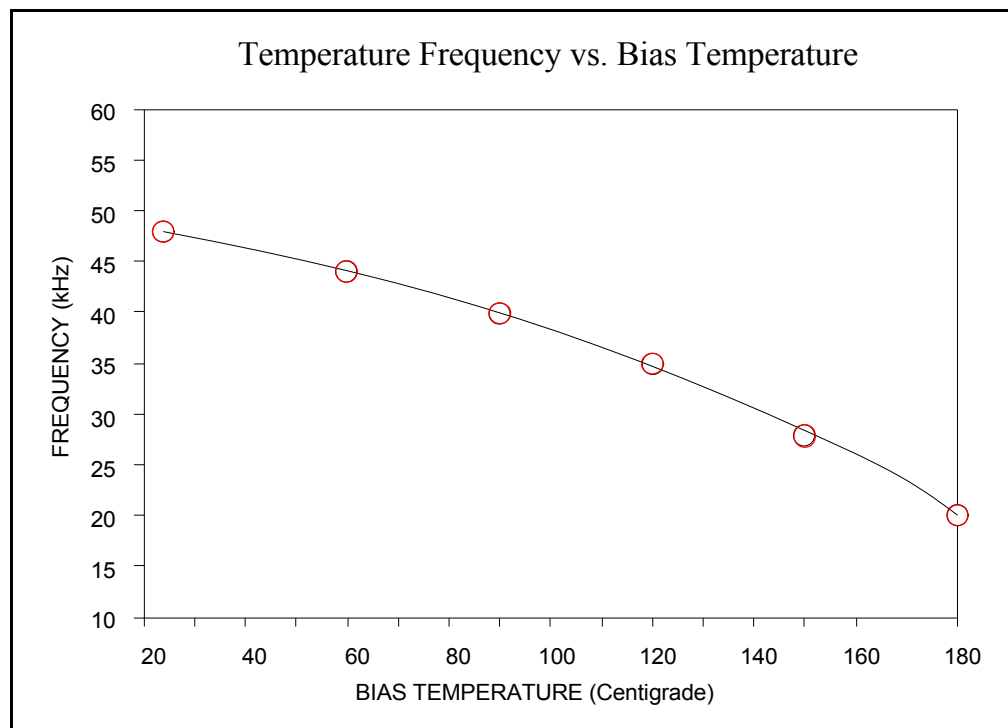


Figure 3.3 - Typical Frequency vs. Bias Temperature Response

## 4 OPERATING PROCEDURE

Ref.: General Assembly Drawing 09509

### 4.1 BEFORE LOGGING CHECKS

#### Mechanical

- 1 Clean and grease upper and lower O'ring seals. Replace O'rings if damaged.
- 2 The tool should have previously been flushed with clean oil, see [Section 5.2.1 Flushing](#). Remove the Transport Screw Plug (if present, item 18) from the well port in the Lower Sub (item 2) before logging to allow well pressure to reach the Pressure Transducer.

#### Electrical

- 1 Ensure that upper and lower electrical connectors are clean, dry and undamaged.
- 2 Upper head pin to lower head socket resistance < 0.5Ω.

#### Operating

The QPS must be connected to a suitable Telemetry controller eg MPL or XTU and to a data acquisition or logging system eg MEMLOG or MIDAS.

- 1 Raw frequencies may be observed, typical approx values:

Pressure	20kHz
Temperature	55kHz
Ref clock	7.2MHz
- 2 To check calibrated values, Quartzdyne calibration files <tool sn>.CRF and .CRT must be available to the acquisition software. Check that Pressure and Temperature read correct values and are not noisy.

**NOTE:** WARRIOR and MIDAS acquisition software requires that these files have extensions renamed to .CFF and .CFT. .CRF/T files are identified by "R" at the end of the first line; do not alter this label. If non "R" files are used, i.e. original .CFF and CFT files, the calibration will be less accurate.

### 4.2 CONNECTING TO TOOLSTRING

Upper and lower tool joint O'rings and seal surfaces should be clean, undamaged and lightly greased. Remove Transport Screw Plug (item 18) from the well port if present.

The QPS may be inserted in any position below the telemetry. Ensure tool to tool joints are tight. Do not hit tools hard with metal objects.

### 4.3 LOGGING

Maximum running speed: 200ft/min, slowing for completion items and to exit tubing.

Recommended logging speed: 30ft/minute. Slowing improves data quality.

**Centralisers.** The pressure sensor works equally well centered or eccentered.

### 4.4 POST LOGGING DISASSEMBLY

The tool should be cleaned before the toolstring is disassembled.

Ensure that well fluid does not reach the electrical connectors. Disassemble in a horizontal position wherever possible.

Refit thread protectors as soon as possible after disassembling the toolstring to prevent damage to the O'rings and sealing surfaces.

**IMPORTANT: Well port must be flushed clean. See [Section 5.2.1 Flushing](#).**

If the tool experiences high temperature (above 150°C) or H<sub>2</sub>S gas, replace O'rings according to [Section 5.4 Maintenance](#).

### 4.5 TRANSPORTATION, HANDLING AND STORAGE

Store with end threads lightly greased and with water tight thread protectors fitted.

Keep the well ports clean and filled with silicone oil. Fit the transport screw (item 18).

Do not subject the tool to extreme shock such as dropping or hitting with a hard object.

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## 5 MECHANICAL DESCRIPTION

Ref.:	General Assembly Drawing	09509
Ref.:	Pressure Isolation Head Assemblies manual	MN-PIH

### 5.1 DESCRIPTION

See [Section 3 Theory Of Operation](#) for general description.

The QPS019 contains a Quartzdyne gauge with attached fluid protection bellows. The metal to metal pressure seal between bellows and gauge should not be unscrewed otherwise the calibration will be invalid. A similar maintenance free seal connects the bellows to the lower head. This may be disconnected, for example for gauge replacement or re-calibration. The lower head contains well port and filter and flushing port for maintenance.

The gauge and lower electrical connector are wired to the upper electronics.

Upper and lower ends are pressure tight in the event of main external O'ring failure or flood from tool above or below. Rating of this pressure isolation is 8,000psi although this varies with direction of pressure, condition of parts and strength of internal chassis.

A single pressure housing screws onto the Lower Housing sub and is sealed with 2 O'rings.

### 5.2 DISASSEMBLY

The 2 make up O'rings (item 12) on the lower end of the lower head (item 2) can be replaced without disassembling the tool.

#### 5.2.1 FLUSHING

**Note:** Carry out immediately after each job.

- 1 Remove Plug and Filter (items 4 and 17). Take care not to lose the Filter if required for reuse, and have a spare available.
- 2 Remove the flushing plug (item 9). Replace the O'ring (item 13) if required. Using the Flushing Kit, part no 04053, flush silicone oil (use other clean oil or water if not available) into the Flushing Port until the well port is clean.
- 3 Replace the Filter and Port Plugs. Replace the Transport Screw (item 18) so as to trap clean fluid inside the tool.

#### 5.2.2 INTERIOR ACCESS

- 4 Unscrew Housing (item 1) from the lower head (item 2) and slide off. Replace O'rings items 16 and 23 if required.
- 5 Remove 4 off screws (item 10) and remove the top gauge chassis cover (item 3).

**Note:** Do not remove the lower chassis cover if the the top cover has been removed (unless the gauge is to be removed) as this forms an integral part of the assembly.

- 6 To access electronics, remove 4 M3 screws to remove the larger of the 2 chassis covers from item 11.

### 5.2.3 ELECTRONICS REMOVAL

- 7 Unsolder the 6 wires from the electronics assembly (item 11) which pass down to the gauge and lower connector. Remove screws (item 10) to separate the electronics assembly from the gauge chassis (item 3). Check wires for damage.

### 5.2.4 LOWER CONNECTOR REMOVAL

- 8 Remove circlip (item 6) and extract the Lower Head Connector Assembly (item 5).



**Warning!** Beware trapped pressure from a possible recent tool leak. Do not look directly into the lower end when removing circlip.

**Note:** This pressure tight assembly is difficult to remove due to friction over the O'ring (item 21). The source handling tool (part no 00352) supplied with the Sondex FDR is a suitable extraction tool. Alternatively a M5 or 10-32 tap can be used. The connector is best tapped out rather than pulled which can cause it to become free suddenly and the Line wire pulled off.

Do not rotate the Connector assembly, otherwise the anti-rotation pin (item 22) will be damaged.

- 9 Pressure isolation relies on two O'rings:
  - O'ring (item 21) which should be checked for damage and replaced if necessary,
  - A small O'ring internal to the Connector assembly (item 5). This O'ring should not need checking except in the event of a tool flood. The connector assembly can be dismantled if required.
- 10 Check the condition of the line wire and replace if required.

### 5.2.5 QUARTZDYNE GAUGE REMOVAL

This should only be necessary to replace a faulty gauge or for a full recalibration.

- 11 Using a spanner, unscrew the Bellows from the lower head (item 2).
- 12 Remove the Sealing Cone (Olive) (item 24) and discard.

The gauge contains no user serviceable parts and should be replaced complete if faulty.

#### CAUTION!

Do not apply a spanner to the gauge as this may change the bellows set position and void the calibration. Further disassembly of the gauge may invalidate any remaining Quartzdyne warranty.

### 5.3 REASSEMBLY

This is the reverse of [Section 5.2 Disassembly](#), with the following notes.

#### Quartzdyne gauge refit

- 1 Ensure the space into which the gauge bellows will connect is clean.

Use a new Sealing Cone (Olive) (item 24).

- 2 Screw the bellows into the lower head to a torque of 35ft-lbs (47N-M0). There should be a 1mm approx gap between the bellows housing and the lower head; they must not touch. **Do not apply a spanner to the gauge as this may change the bellows set position and void the calibration.**

**Note:** It is advisable to perform an external or dead weight pressure test to check the Sealing Cone for leaks.

- 3 Secure the line wire so that it does not fall outside the chassis (item 3) and become damaged.

#### Lower Connector

- 1 Solder the Line wire to the hole in a modified 10-32 nut.
- 2 The two nuts must be screwed tight against each other. Two spanners are required ( $\frac{3}{8}$ " and  $\frac{5}{16}$ " AF).
- 3 Ensure an O'ring (item 21) is fitted and silicone greased.
- 4 Align with the pin (item 22) and refit the Lower Connector assembly (item 5).

#### Pressure Housing

- 1 Clean and lightly grease O'rings and threads on the lower head.
- 2 The housing and lower head must be screwed up tight.

### 5.4 MAINTENANCE

See also [Section 4.1 Before Logging Checks](#) and [Section 4.5 Transportation, Handling and Storage](#).

If the tool experiences H<sub>2</sub>S gas or temperatures above 150°C, the following O'rings must be replaced:

- Item 16, 2 off
- Item 12, 2 off
- Item 13, 1 off

No other special maintenance is required.

## 6 ELECTRICAL DESCRIPTION

### 6.1 TELEMETRY CIRCUIT BOARD

Ref.: Circuit Diagram

CD82221

The Ultrawire Tool Telemetry Board is based on a common PCB (82205) which is populated and programmed according to the tool in which it is fitted. The main functional blocks of the circuit are the power supply, the Ultrawire interface (together with its drivers and receivers) and the sensor interface.

Control is implemented by a PIC micro-controller in conjunction with an Actel FPGA. The code in the PIC differs according to the tool.

Communication between the Telemetry Controller and the tool is via the Ultrawire toolbus. This is a single pin bus, which carries power to the tool in addition to its telemetry function. The return for both power and signal is via the chassis.

The Ultrawire line carries 18V d.c. (nom). Power is removed from the line by transistors Q1 - Q4 (with associated components) and generate local power rails at 12V and 5V.

The telemetry is modulated onto the line as 1V AMI (alternate mark inversion) at 500kbaud.

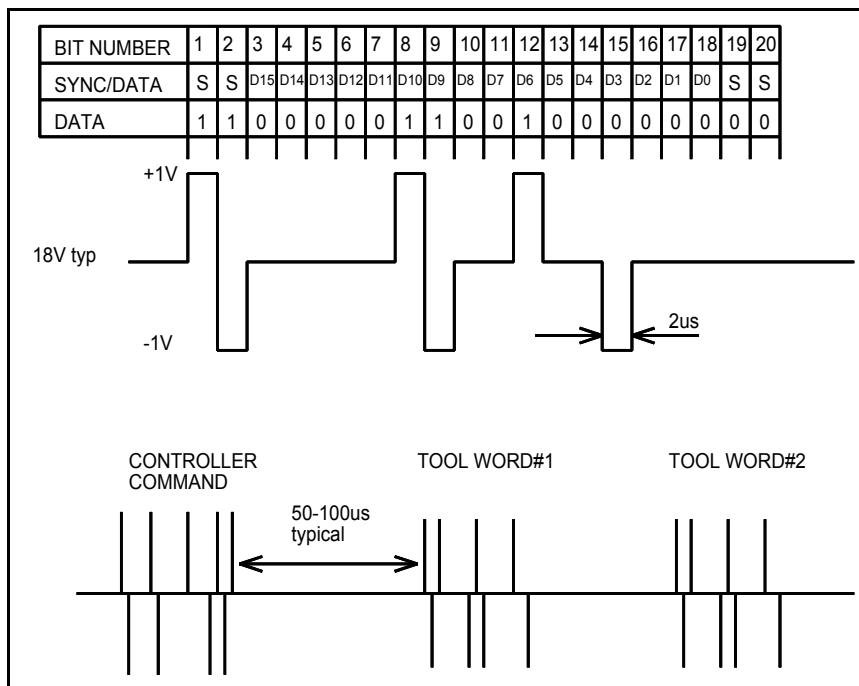


Figure 6.1 Ultrawire Signal Shape example

The Ultrawire telemetry is a master slave protocol. The controller, which is always the master, sends a command to the tool. This may be a global command (to all tools) or a tool specific command which contains the address of the target tool. The tool's "hard" address is set in the range 0-63 by links AD0-AD5. Tool specific commands are acknowledged by the tool, global commands are executed but do not generate a response.

For rate-meter type tools, count pulses are collected from the sensor on inputs 1-7 of the PCB. These are counted in hardware by the Actel, (U4) and accumulated by the PIC (U5).

When the controller is in logging mode, it will periodically send a global "Sample Now" command to all the tools and then poll each tool individually with a "Send Data" command. The "Sample now" command causes the latest count to be frozen in a shadow register, and this count is then passed to the controller in response to the "Send Data" command.

Electrically, the telemetry is a.c. coupled from the line to the drivers and receivers by C14. The received data is removed from the line by a pair of comparators, U1, and passed to the Actel, which validates the address. The command is interpreted by the PIC which if necessary generates the response packet and passes it to the Actel. The Actel drives Q6 and Q7, which modulate the line.

Ultrawire words are 20 bits long. The first and last two bits are for synchronisation. The first bit is always '1'. The intervening 16 bits are tool data.

## 7 EXTENDED CHECKS

### 7.1 PREVENTATIVE MAINTENANCE

#### 7.1.1 GREASE AND LUBRICANTS

Sondex recommends the use of "Liquid O Ring type 101". Sondex pt no LOR101(L). See [APPENDIX A](#).

All O'rings and housing threads are assumed to be and must be lightly greased unless specifically indicated differently.

Correct use of grease and lubricants is essential to the maintenance of all Sondex downhole equipment.

Note that some threads are internal such that grease can get inside the tool. Do not use excessive quantities.

Sondex does not recommend Copper loaded greases since some types can cause electrical leaks. Some types are also not suitable for use on O'rings. Silicone grease may be used on O'rings but must be kept clear of threads especially stainless to stainless.



**Warning!** The use of certain greases such as some types of Lubriplate can cause electrical failure if they have any volatile content. This can burn off producing corrosive gasses inside the tool.

#### 7.1.2 MECHANICAL

- 1 Remove dirt and old grease from pressure housing threads and O'rings and replace with fresh.
- 2 Inspect O'rings for damage or ageing/hardening and replace where required.
- 3 Check for:
  - Damaged wires.
  - Wires that are loose and likely to be crushed on re-assembly.
  - Damaged components.
  - Loose screws/nuts/components/Connectors

**Note:** If RTV or similar compound is used to correct loose components, it must be fully cured before housing is replaced.

- Electrical components shorting to chassis.
  - Heat or chemical damage (discoloured components).
  - Incorrect thread grease or excessive quantity, see [Section 7.1.1](#).
  - Check any connectors for cleanliness and loose/bent pins before replacing.
- 4 Check all fixings for tightness.
  - 5 Flushing and well ports should be kept clean and oil filled, see [Section 5.2.1 Flushing](#). Check Filter (09509, item 17).

### 7.1.3 ELECTRICAL

- 1 Check through line resistance and tool current, see [Section 4.1](#) .
- 2 Connect to Logging System and check for correct data. Apply some gentle vibration and rotation to expose potential failure.

### 7.1.4 PRESSURE CALIBRATION CHECK

Note that Quartzdyne gauge calibrations usually remain accurate for up to 3 years or more, depending on use, see [Section 7.2 Pressure Calibration](#). Customer contracts may require full calibrations more frequently, possibly every 12 months.

Gauge calibration can be checked by comparing 2 or more gauges for agreement. The gauges MUST be at a constant, uniform temperature.

**Note:** See [Section 1.3](#) for well port thread specification.

The Calibration may also be checked at two or more points.

A very severe test is to subject the gauge to a high pressure but low temperature (eg 10000 psi 20 ° C).

This is way off its normal measuring range so if it reads OK here then the gauge is very unlikely to be out elsewhere.



**Warning!** Applying high pressure, especially at high temperature, to the well port only, may cause the Flushing port O'ring to fail. This should therefore be covered to prevent injury from a jet of hot oil or O'ring fragment.

Heating the gauge at 14 psi is a less good check. Note that the accuracy spec below 100 psi is quoted as very poor (in practice its not too bad) due to the bellows so a bad reading here does not necessarily indicate a bad gauge.

Note that any reference pressure reading is only as accurate as the test equipment, second gauge or dead weight tester.

Quartzdyne's Compute.exe program which converts frequency readings to pressure and temperature may be useful for testing without a logging system.

### 7.1.5 AGEING OF ELECTRONICS

At 150°C, significant electronic ageing failures are expected after 4000hrs typical use, hence PCB replacement should be considered at this point. Every additional 10°C halves the time. Ageing is also accelerated by vibration and corrosive gas inside the chassis. Visual inspection and logging previous history is recommended but is unlikely to predict premature failure.

Tools which may be suspected of reliability problems due to age or unusual log response may be heated to 120°C, which would not normally age the electronics, and then subjected to moderate vibration. A moderately hard blow from a wooden hammer is recommended. **DO NOT USE METAL HAMMERS.**

**7.1.6 HEAT TESTING ABOVE 150° C**

This is not generally recommended since it shortens tool life expectancy.

It may be required for contractual reasons, if the tool is out of use for a long period, or if running a job with an unusually high well temperature.

The test should be carried out only slightly above expected well temperature, and the tool should not be kept at temperature for more than 1 hour.

**7.2 PRESSURE CALIBRATION**

This must only be performed by qualified personnel with sufficiently accurate temperature and dead weight pressure equipment. Such equipment is usually only to be found at specialist test houses or large oilfield service companies. Sondex does not supply this equipment.

Quartzdyne's Curvefit.exe program generates cal files from a .DAT file. Format should be as described in Curvefit.txt and not as the .DAT file supplied with the gauge.

The gauge is normally removed from the QPS tool for calibration hence must be pressure tested for leaks when re-fitted.

Note that the Flushing port O’ring may fail at high temperature and pressure hence should be covered for safety.

**7.3 TROUBLE SHOOTING**

An oscilloscope, multimeter and other basic test equipment will be required.

<b>Initial Inspection</b>	Check for:  Damaged wires. Damaged components. Electrical components shorting to chassis. Heat or chemical damage (discoloured components). Incorrect thread grease or excessive quantity, see <a href="#">Section 7.1.1</a> .
<b>Excessive Current</b>	Disconnect from 82221 circuit: Line Up wire, Line Down wire, +12V to gauge. Apply Line signal or 18V direct to 82221 Line connection.  If no effect: Fault find or replace 82221 circuit.  If fault corrected: Apply up to 250V relative to chassis on isolated Line Up and Down to check for electrical leak. Resistance should exceed 100MΩ. Connect 12V to gauge, look for damaged wires if faulty. The gauge has no user serviceable parts; replace if faulty.
<b>Little or no Current</b>	Check 18V Line voltage on 82221 and 0V wire connects to chassis.  Fault find or replace 82221 circuit.

<p><b>No Telemetry Reply</b></p>	<p>Check 0V, 5V and 12V on 82221.</p> <p>Check TP1 for 4MHz &gt;3V clock. Replace U2 if faulty. Reduce R26 value if clock &lt;3V amplitude.</p> <p>Check Line for +1V and -1V, 2µs pulses from Controller and similar pulses from tool.</p> <p>Pulses should have no ringing. If ringing, also attach bottom tool (CTF, other bottom flowmeter or toolstring terminator). Logic pulses should be present on 82221 TP3,4,5&amp;6.</p> <p>If no tool response words on Line, fault find or replace 82221 circuit.</p>
<p><b>Incorrect Pressure Data</b></p>	<p>Check 0V and +12V to gauge.</p> <p>On 82221, check:          Pin 3 Temperature frequency 5V logic 40-60kHz          Pin 4 Pressure frequency 5V logic 15-25kHz          Pin 5 Reference frequency 5V logic 7.2MHz</p> <p>If wrong, look for damaged wires. The gauge has no user serviceable parts, replace if faulty.</p>

## APPENDIX A EQUIPMENT AND RECOMMENDED SPARES

Item	Part no.	Description	Qty	Remarks
1	QPS019	Ultrawire Quartz Pressure Gauge Tool	1	

### A.1 ANCILLARY EQUIPMENT

#### Special Tools

Item	Part no.	Description	Qty	Remarks
1	91050	Tool Kit for 1 <sup>11</sup> / <sub>16</sub> "tools	1	
2	04053	Flushing Kit Assembly	1	Supplied as part of Basic Spares Kit

### A.2 RECOMMENDED SPARES

Item	Part no.	Description	Qty	Remarks
1	KITB-QPS	Basic Spares Kit for QPS	1	To support one run in hole
2	KITR-QPS1 11/16	Recommended Spares Kit	1	To support 25 runs in hole
4	KITRem-PIH,SX	Remote Spares Kit, Isolation Head	1	See Pressure Isolation Head manual <i>MN-PIH</i>
5	LOR101	Grease for O'rings and threads	1	5oz pot
6	LOR101L	Grease for O'rings and threads	1	16oz pot

PARTS LISTING					
Part:  <b>91050</b>	Issue:  -		Drawn: NGH	Checked: PD	Approved: DJF
			Date: 14/01/2002	Date: 14/01/2002	Date: 14/01/2002
Description: Tool Kit for all 1 11/16 Tools SX and GO					

CHANGE HISTORY				RELATED DOCUMENTS			
Iss	Date	Remarks	Chkd	Appr	# Documents	Issue	Notes
-	14/01/2002	Initial Release	PD	DJF			

PARTS LIST							
Item	Part No.	Issue	Description	Component Value	Qty	Units	Remarks
001	91005	-	Spanner Open Ended 42mmx38mm		2	ea	
002	91019	-	Spanner C 50mm 35mm		1	ea	
003	10038	A	Spanner Box 3/8 x 5/16 Modified		2	ea	
004	91028	-	Spanner 3/8x5/16		1	ea	
005	91027	-	Spanner Single Open End 18mm		1	ea	
006	91029	-	Key Hex Metric		1	ea	
007	91030	-	Punch Pin Parallel set		1	ea	
008	00615	A	Assy Spanner PKJ		1	ea	
009	91293	PT1	Screwdriver Parallel tip (3 0 x 75)		1	ea	
010	91105	-	Toolroll With SX Badge Large Black		1	ea	
011	91104	-	Screwdriver Parallel tip (5 5 x 200)		1	ea	
012	91103	-	Pliers Circlip 812 Chrome/Van		1	ea	
013	91102	-	Pliers Mini Flat Nose 5 Inch		1	ea	
014	10037	A	Bar Tommy		2	ea	
015	10051	A	Kemlon tool Sondex - 4BA Hex Socket		1	ea	
016	91280	-	Hammer, 4oz ball pein		1	ea	
017	91130	-	Pin C Spanner 35-50mm		1	ea	

(AR = As Required)

<b>PARTS LISTING</b>					
Part:  <b>KITB-QPS</b>	Issue:  -		Drawn:	Checked:	Approved:
			Date: --/--/--	Date: --/--/--	Date: --/--/--
Description: Kit, Spares, Basic, QPS					

<b>CHANGE HISTORY</b>					<b>RELATED DOCUMENTS</b>		
Iss	Date	Remarks	Chkd	Appr	# Documents	Issue	Notes
-	--/--/--						

<b>PARTS LIST</b>							
Item	Part No.	Issue	Description	Component Value	Qty	Units	Remarks
001	05309	C	Plug - Flushing Port		1	ea	
002	01029	-	Screw, Csk Hd(Slotted), M3 x 06mm Lg, St/Steel		2	ea	
003	93040	-	Screw Skt Cap Hd M3x05mm Lg SS		1	ea	
004	04053	D	Assy Flushing Kit (QPS, ILS, PSJ, DBT)		1	ea	

(AR = As Required)

<b>PARTS LISTING</b>					
Part:  KITR-QPS1 11/16	Issue:  A	Drawn: DJ	Checked: RH	Approved: RH	
		Date: 25/07/2002	Date: 09/08/2002	Date: 09/08/2002	
Description: Kit, Spares, Recommended(25Run), QPS(1 11/16)					

CHANGE HISTORY					RELATED DOCUMENTS		
Iss	Date	Remarks	Chkd	Appr	# Documents	Issue	Notes
A	25/07/2002	ECR1279. Kit P/List Approved	RH	RH			

PARTS LIST							
Item	Part No.	Issue	Description	Component Value	Qty	Units	Remarks
001	04046	C	Screw Filter Retaining		1	ea	
002	05309	C	Plug - Flushing Port		1	ea	
003	05310	A	Filter Gauze		5	ea	
004	93040	-	Screw Skt Cap Hd M3x05mm Lg SS		5	ea	
005							
006							
007	99008	-	O Ring Viton 90 Type 008		5	ea	
008	99124	-	O Ring Viton 90 Type 124		50	ea	
009	99211	-	O Ring Viton 90 Type 211		50	ea	
010							

(AR = As Required)

## **APPENDIX B DRAWINGS AND PARTS LISTS**

### **B.1 MECHANICAL DRAWINGS**

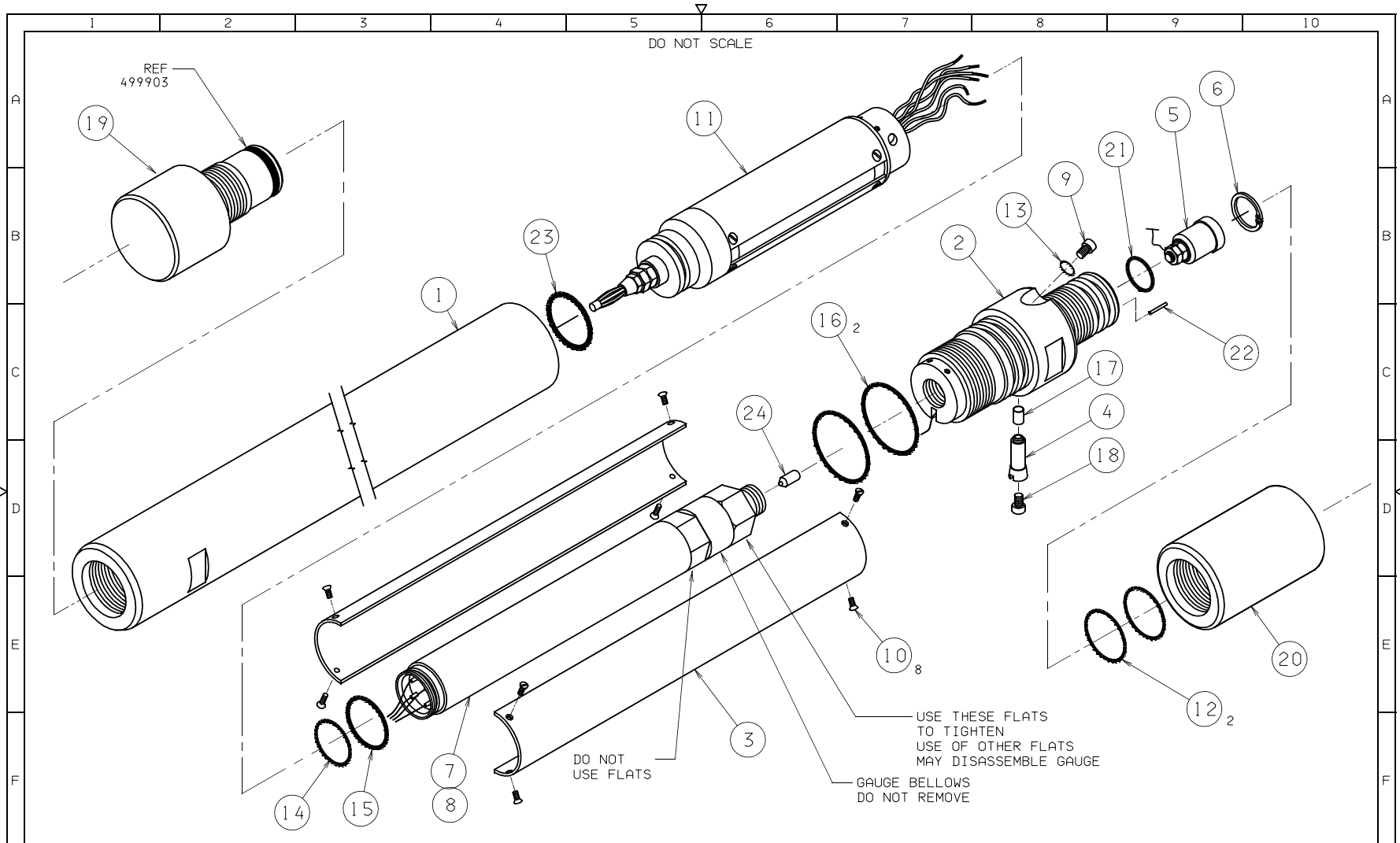
QPS019 1<sup>11</sup>/<sub>16</sub>" Ø, Quartzdyne Bellows, Ultrawire  
QPS Electronics Assembly, Ultrawire  
Lower Connector Assembly

Drawing/Parts List *09509-B*  
Drawing/Parts List *82127-B*  
Drawing/Parts List *10057-B/C*

### **B.2 ELECTRICAL DIAGRAMS**

QPS, Ultrawire  
QPS Ultrawire Telemetry Board (2 sheets)

Wiring Diagram *WD-82127-A*  
Circuit Diagram *CD-82221-E01-x*



DRAWN NGH DATE 24/09/01 DIM IN INCHES SCALE NTS	CHECKED AJB DATE 14/11/01	APPROVED DJF DATE 14/11/01	ISS B A	DESCRIPTION RE: ECR 1577 INITIAL RELEASE	APPD DJF DATE 20/05/03 DJF 14/11/01	<b>Sondex</b> Tel. 0118 932 6755 THIS DRAWING IS THE PROPERTY OF Sondex AND SHALL NOT BE COPIED OR USED WITHOUT PRIOR PERMISSION THIRD ANGLE PROJECTION	USED ON QPS019 MACHINE FINISH 63/	GEN TOL 0. X ±0.020" 0. XX ±0.010" 0. XXX ±0.005" ANGLE ±0.5°	TITLE ASSY QUARTZ PRESSURE MkII UW SX SHEET 1/1 DRAWING No. 09509 ISSUE B
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B-2

### Quartz Pressure Tool

**QPS019**

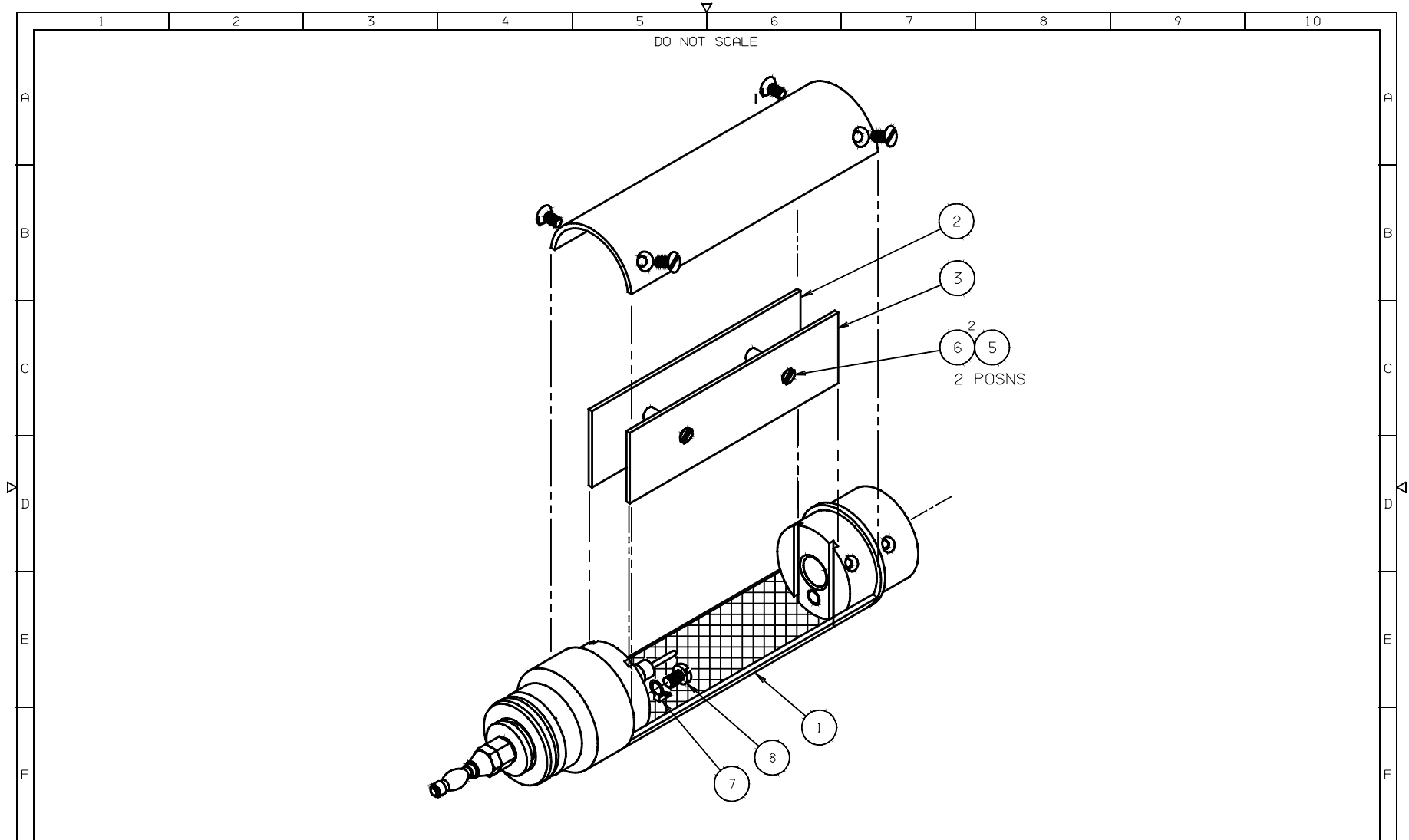
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<b>PARTS LISTING</b>					
Part:	Issue:		Drawn:	Checked:	Approved:
09509	B		NGH	AJB	DJF
			Date:	Date:	Date:
			13/09/2001	28/09/2001	14/11/2001
Description: Assy Quartz Pressure MKII UW SX					

<b>CHANGE HISTORY</b>					<b>RELATED DOCUMENTS</b>		
Iss	Date	Remarks	Chkd	Appr	# Documents	Issue	Notes
A	14/11/2001	Initial Release	AJB	DJF	01 AD-09509	B	Assembly Drawing
B	22/05/2003	Re: ECR 1577			02 TP-09509	PT2	Test Procedure
					03 TR-09509	PT2	Test Result Sheet
					04 CP-09509	PT1	Commissioning Procedure

<b>PARTS LIST</b>							
Item	Part No.	Issue	Description	Component Value	Qty	Units	Remarks
001	04059	A	Housing Pressure 1-11/16 (UW)		1	ea	
002	04044	D	Sub Lower Mk2		1	ea	
003	04043	A	Halfshells Chassis & Cover		1	pr	
004	04046	C	Screw Filter Retaining		1	ea	
005	10057	C	Assy Connector Lower SX Sealing Type		1	ea	
006	01047	A	Circlip, Internal, 5/8, St/Steel		1	ea	
007	92018	-	Quartzdyne Downhole Pressure Transducer, With Bellows		1	ea	
008	A011-002M4	-	Heatshrink Sleeving, Polyvinylidene Fluoride, +175C	2.4mm Dia		(AR)	
009	05309	C	Plug - Flushing Port		1	ea	
010	01029	A	Screw, Csk Hd(Slotted), M3 x 06mm Lg, St/Steel		8	ea	
011	82127	B	Assy, QPS, 1 11/16, Electronics, (Ultrawire)		1	ea	
012	99211	-	O Ring Viton 90 Type 211		2	ea	
013	99008	-	O Ring Viton 90 Type 008		1	ea	
014	99019	-	O Ring Viton 90 Type 019		1	ea	
015	99020	-	O Ring Viton 90 Type 020		1	ea	
016	99124	-	O Ring Viton 90 Type 124		2	ea	
017	05310	A	Filter Gauze		1	ea	
018	93040	-	Screw Skt Cap Hd M3x05mm Lg SS		1	ea	
019	10148	A	Thread Protector, Male, Standard, (Upper End) with O'Ring		1	ea	
020	01019	C	Thread Protector, Female, Standard (Lower End)		1	ea	
021	95112	-	O Ring Viton 75 Type 112		1	ea	
022	93019	-	Pin, Spirol, 1mm x 8mm Lg, SS		1	ea	
023	95211	-	O Ring Viton 75 Type 211		1	ea	
024	92118	-	Sealing Cone, (Olive), Quartzdyne QB Bellows			Referenøe ONLY	Supplied with Item 7

(AR = As Required)



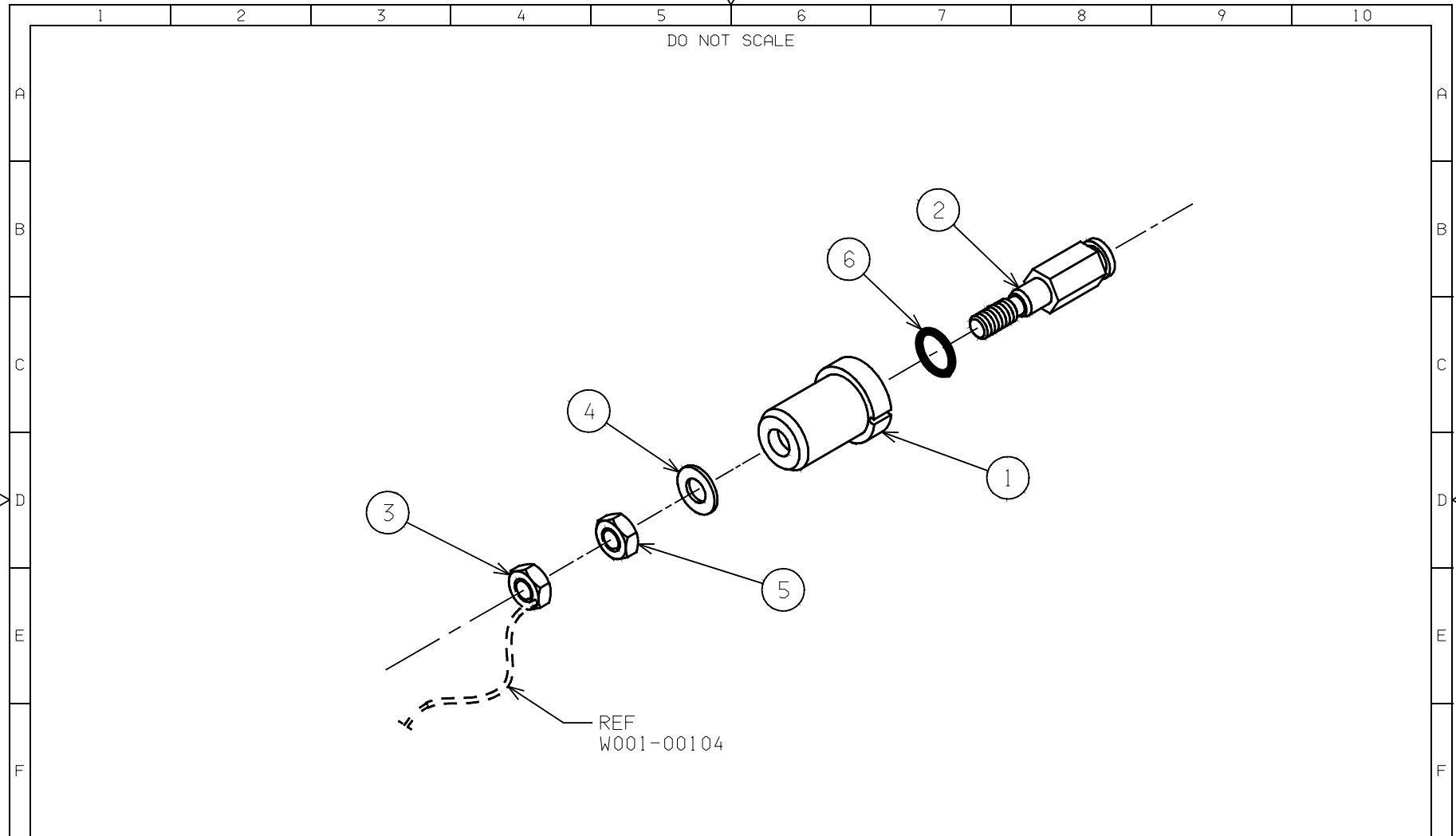
DRAWN NGH	CHECKED RLH	APPROVED RLH	ISS B	DESCRIPTION RE: ECR 1577	APPD DJF	DATE 20/05/03	<b>Sondex</b> Tel. 0118 932 6755 THIS DRAWING IS THE PROPERTY OF Sondex AND SHALL NOT BE COPIED OR USED WITHOUT PRIOR PERMISSION	USED ON 09509	TITLE ASSY QPS $\varnothing$ 1-11/16" ELECTRONICS (ULTRAWIRE)		
DATE 24/09/01	DATE 12/11/01	DATE 12/11/01	A	INITIAL RELEASE	RLH	12/11/01		MACHINE FINISH 63/	GEN TOL 0. X $\pm$ 0.020" 0. XX $\pm$ 0.010" 0. XXX $\pm$ 0.005" ANGLE $\pm$ 0.5°	SHEET 1/1	DRAWING No. 82127
DIM IN INCHES		MATL: SEE DETAIL DRAWINGS		THIRD ANGLE PROJECTION							
SCALE NTS	A 3										

PARTS LISTING					
Part: <b>82127</b>	Issue: <b>B</b>		Drawn: <b>NGH</b>	Checked: <b>RH</b>	Approved: <b>RH</b>
Description: Assy, QPS, 1 11/16, Electronics, (Ultrawire)			Date: 13/09/2001	Date: 15/11/2001	Date: 15/11/2001

CHANGE HISTORY					RELATED DOCUMENTS			
Iss	Date	Remarks	Chkd	Appr	# Documents	Issue	Notes	
A	15/11/2001	Initial Release			01	WD-82127	A	Wiring Diagram
B	22/05/2003	Re: ECR 1577	DJF	DJF				

PARTS LIST							
Item	Part No.	Issue	Description	Component Value	Qty	Units	Remarks
001	10585	B	Assy Chassis 1 Module QPS SX (Mechanical)		1	ea	
002	82226	E	Assy, QPS Telemetry PCB		1	ea	
003	80016	A	Bare PCB		1	ea	
004							
005	93261	A	Spacer, Round, M3 Thru, 4.75mmOD x 12.7mmLG, Brass/NickelP		2	ea	
006	01029	-	Screw, Csk Hd(Slotted), M3 x 06mm Lg, St/Steel		4	ea	
007	93097	-	Tag Solder M3		2	ea	
008	93048	-	Screw, Pan Hd Slotted, M3 x 6mm Long, St/Steel		2	ea	
009							
010	W001-00104	-	Wire, 7/0.2, PTFE Type A, Yellow	7/0.2		(AR)	
011	W001-00200	-	Wire, 7/0.12, PTFE Type A, Black			(AR)	
012	W001-00202	-	Wire, 7/0.12, PTFE Type A, Red			(AR)	
013	W001-00203	-	Wire, 7/0.12, PTFE Type A, Orange			(AR)	
014	W001-00205	-	Wire, 7/0.12, PTFE Type A, Green			(AR)	
015	W001-00209	-	Wire, 7/0.12, PTFE Type A, White			(AR)	
016							
017	A049-006m4	-	Black Polyolefin Heat Shrink Sleeving 6.4mm	6.4mm		(AR)	
018							
019	A006-0099C	-	Solder Wire, 331 O.W/Sol., Alloy Sn99.3/Cu0.7, Core#66(3.3%)	Sldr Wire 99C		(AR)	

(AR = As Required)



DRAWN JDR	CHECKED AJG	APPROVED DJF	ISS B	DESCRIPTION REFER TO ECR 1524	APPD DJF	DATE 06/06/03	<b>Sondex</b>	MACHINE FINISH 63/	USED ON COM	TITLE ASSY CONNECTOR LOWER SONDEX SEALING TYPE
DATE 07-10-98	DATE 04-01-99	DATE 21-01-99	A	INITIAL RELEASE			Tel. 0118 932 6755	GEN TOL 0.X ±0.020"		SHEET 1/1
DIM IN INCHES 1:1	MATL: 4	SEE DETAIL DRAWINGS					THIS DRAWING IS THE PROPERTY OF Sondex AND SHALL NOT BE COPIED OR USED WITHOUT PRIOR PERMISSION	0.XX ±0.010"		DRAWING No. 10057
							THIRD ANGLE PROJECTION	0.XXX ±0.005"		ISSUE B
								ANGLE ±0.5°		

SONDEX FM No: F0024

B-6

## Quartz Pressure Tool

## QPS019

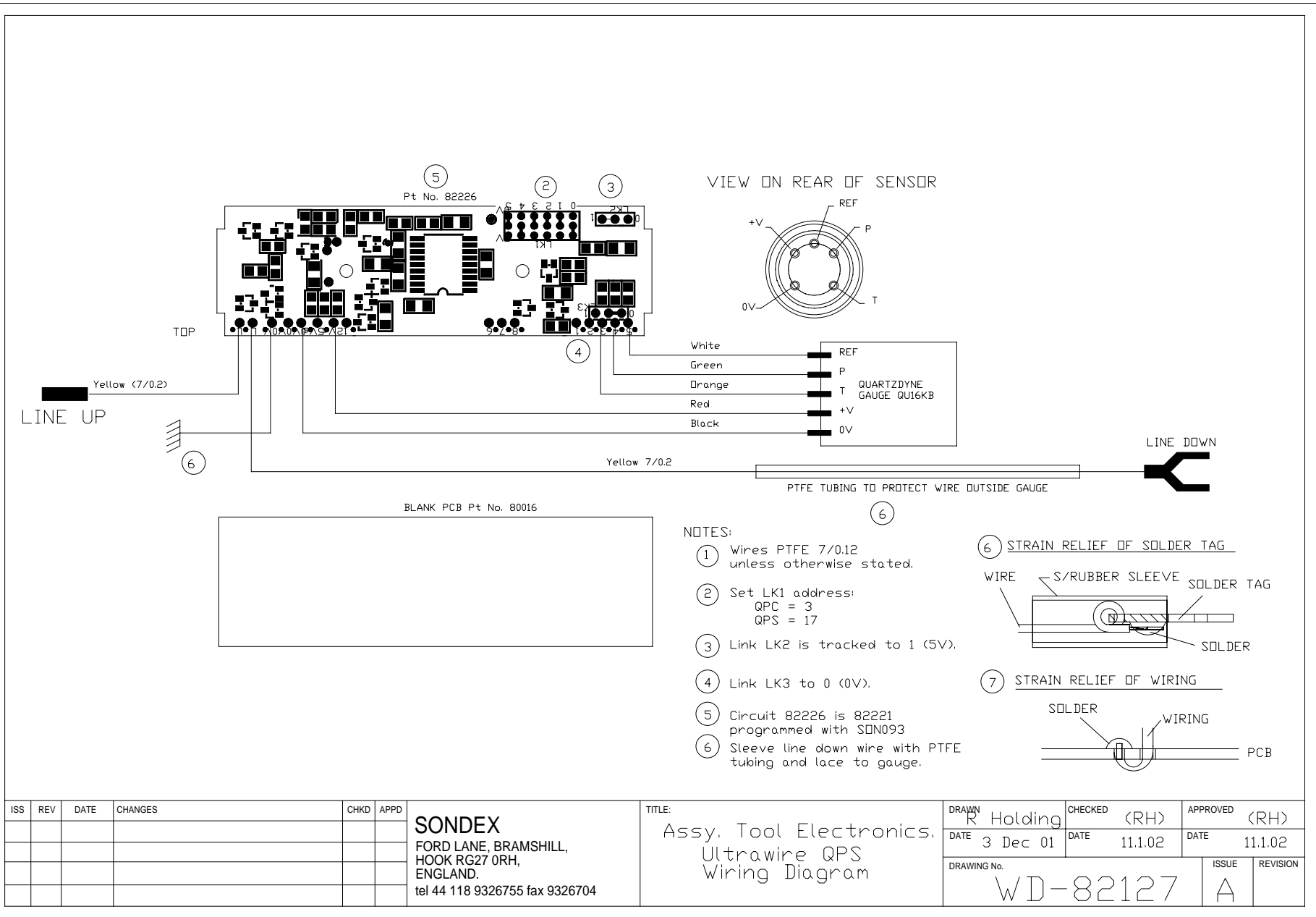
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<b>PARTS LISTING</b>					
Part:	Issue:		Drawn:	Checked:	Approved:
10057	C		JDR	AJG	DJF
Description:			Date:	Date:	Date:
Assy Connector Lower SX Sealing Type			07/10/1998	04/01/1999	21/01/1999

CHANGE HISTORY					RELATED DOCUMENTS		
Iss	Date	Remarks	Chkd	Appr	# Documents	Issue	Notes
A	21/01/1999	Initial Release	AJG	DJF			
B	--/--	DESIGN MOD TO PREVENT STRAY BURR SHORTING TOOL, ECR 1046					
C	11/05/2003	Re: ECR 1527	DJF	DJF			

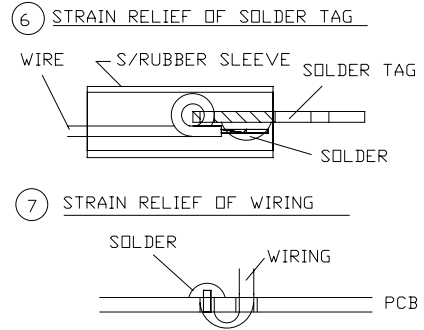
PARTS LIST							
Item	Part No.	Issue	Description	Component Value	Qty	Units	Remarks
001	00690	D	Insulator Lower Sub		1	ea	
002	00695	B	Pin Hex Female Lower		1	ea	
003	10016	B	Nut, Hex, 10-32UNF, Brass/Nickel Plate, (with wire hole)		1	ea	
004	01027	-	Washer, Plain, 10-32UN, St/Steel		1	ea	
005	01026	-	Half-Nut, Hex, 10-32UNF, St/Steel		1	ea	
006	95009	-	O Ring Viton 75 Type 009		1	ea	

(AR = As Required)



NOTES:

- ① Wires PTFE 7/0.12 unless otherwise stated.
- ② Set LK1 address:  
QPC = 3  
QPS = 17
- ③ Link LK2 is tracked to 1 (5V).
- ④ Link LK3 to 0 (0V).
- ⑤ Circuit 82226 is 82221 programmed with SON093
- ⑥ Sleeve line down wire with PTFE tubing and lace to gauge.

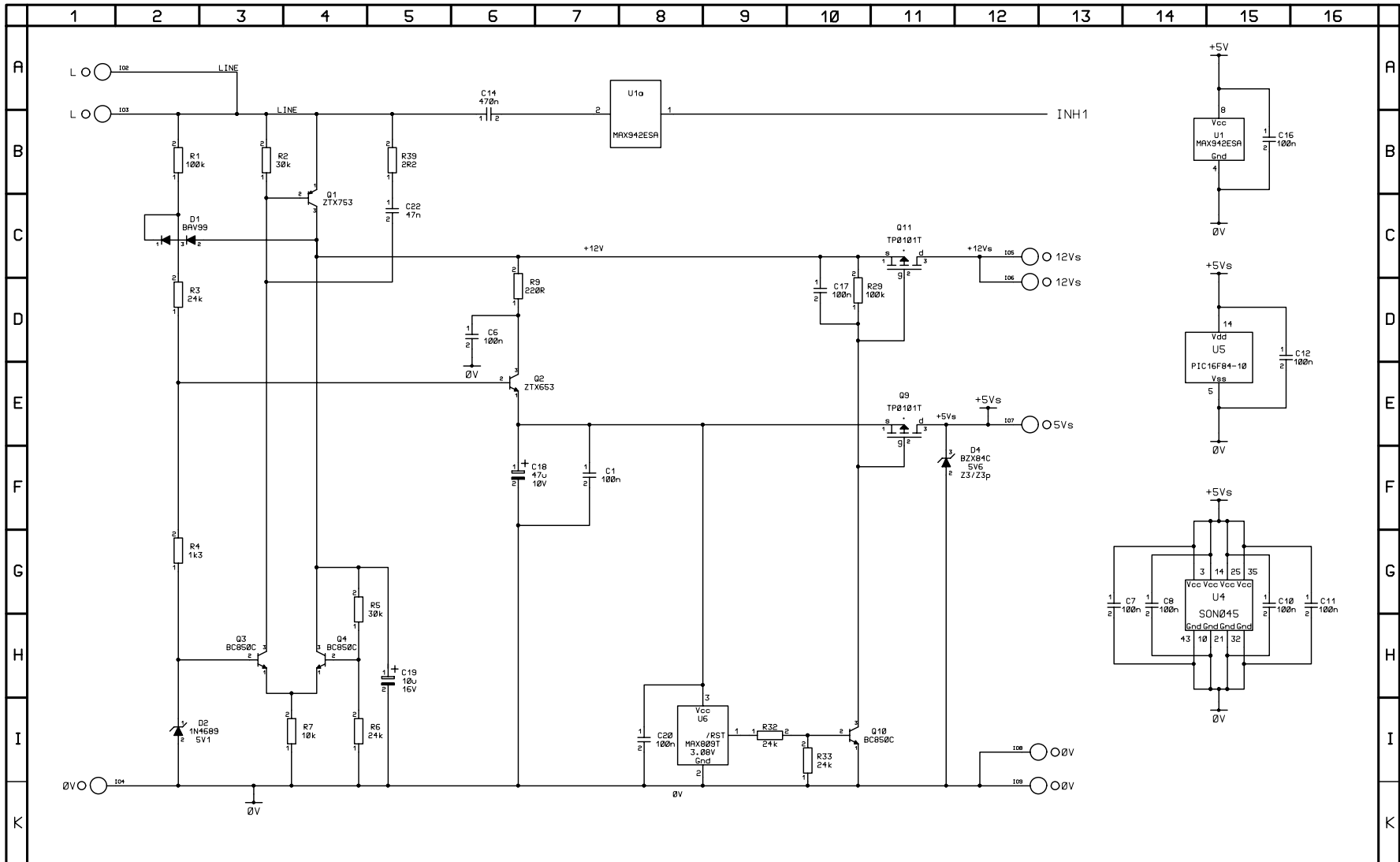


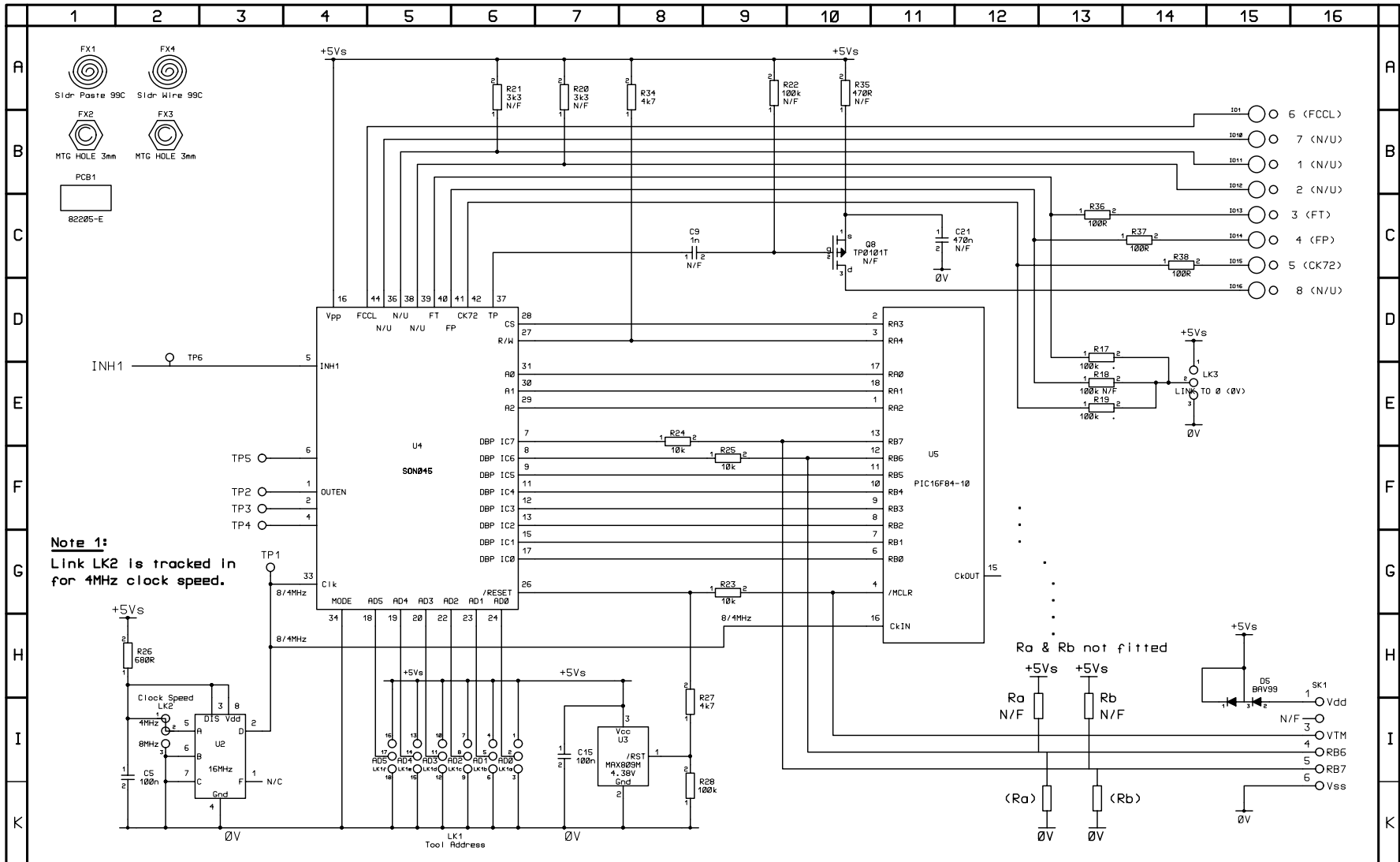
ISS	REV	DATE	CHANGES	CHKD	APPD

**SONDEX**  
 FORD LANE, BRAMSHILL,  
 HOOK RG27 0RH,  
 ENGLAND.  
 tel 44 118 9326755 fax 9326704

TITLE:  
 Assy. Tool Electronics.  
 Ultrawire QPS  
 Wiring Diagram

DRAWN R Holding	CHECKED (RH)	APPROVED (RH)
DATE 3 Dec 01	DATE 11.1.02	DATE 11.1.02
DRAWING No. WD-82127	ISSUE A	REVISION





ISS.	REV.	ECR NUMBER, REMARKS	CHKD	APPR	DATE	TITLE	DRAWING NUMBER	ISSUE	REVISION
E	01x	ECR1150 U4 was SON045F				SONDEX LTD FORD LANE, BRAMSHILL, HOOK, HAMPSHIRE, RG27 0RH, ENGLAND TEL: +44 (0) 118 932 6755 FAX: +44 (0) 118 932 6704	CD-82221	E	01x
						Ultrawire Telemetry Board			
						GPC Tool			
						Circuit Diagram			
						This document contains proprietary information. Copyright 2001 © Sondex Ltd.			
							DRAWN	CHECKED	APPROVED
							DJ		
							DATE	DATE	DATE
							12/08/03		
							SHEET	2	OF 2