XTU002

Document: MN-XTU002-D

XTU Downhole Controller

XTU DOWNHOLE CONTROLLER

$1^{11}/_{16}$″ ULTRALINK™/ULTRAWIRE™ DOWNHOLE CONTROLLER

Operational & Maintenance Manual

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Created: July 18, 2008

Contents

0 ABOUT THIS MANUAL

0.1 MANUAL HISTORY

Date	Issue	Description	Auth	Chk	App
17/02/05	A	Initial release.	SA	FV	SE
23/05/06	B	ECR2489, 2646, 2753, 2909, 2774, 3388, 3435.	FV	SA	SE
06/03/07	C	Diagram updatesL ECR4102, 4468, 4011.	FV	FV	RLH
26/06/08	D	Diagram updates ECRs 4769, 4963, 4588, 5556, 3697, 3721, 3789.	RS	RH	RH

0.2 UPDATES TO BE USED WITH THIS MANUAL

Consult the CD Directory for the appropriate Manual Updates to be used with this Manual.

0.3 TECHNICAL HELP

For further technical help, contact Sondex as follows:

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0.4 FEEDBACK

Please help us improve future issues of this manual by sending your comments or corrections to Documentation-UK@sondex.com, referencing the document number.

Thank You.

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.

Documents from external sources (i.e. MSDS), supplied with/referenced in this manual, are considered the latest version at time of manual issue. However, the document can be altered by the external source without prior notice to Sondex.

1 EQUIPMENT

The XTU Downhole Controller is an intelligent bridge between the Ultrawire™ toolbus and the Sondex Ultralink™ telemetry system. It serves as a communications interface and a programmable logging controller. It also incorporates a DC-DC converter (switch mode power supply) to convert the high voltage on the Ultralink™ line to power the Ultrawire™ toolbus.

In its capacity as a logging controller, the XTU polls each tool on the toolstring for its data packet and assembles these data packets into frames for uplink to the surface. The sequence, in which the tools are polled, is either automatically generated by a logging program or specified by the operator. By default, the polling program is generated and executed by the XTU without any intervention from the surface system, making logging a very simple process.

Figure 1.1 XTU

1.1 PURPOSE

The purpose of the XTU Downhole Controller is:

- To collect data from tools on the Ultrawire™ toolbus and to transmit the data to surface via the Ultralink™ line (via user control or automatically).
- To facilitate bi-directional communication between the surface system and individual Ultrawire™ tools.
- To convert high voltage DC power from the Ultralink™ line to supply the low voltage tools on the Ultrawire™ toolbus.

1.2 FEATURES

The XTU features:

- Fully automatic "plug and play" configuration and start-up.
- Automatic identification of all the tools in the toolstring.
- Automatic generation of a default polling program that enables all the identified tools to share the available bandwidth on the wireline.
- Automatic transmission of the toolstring configuration to the surface system.
- Selectable Ultralink™ bit rate (50-200kbits/s) to suit varying demands and conditions.
- Automatic downlink failure detection triggers reversion to default bit rate.
- Support for sophisticated downloadable user defined logging programs.
- Detailed toolbus error detection and logging to facilitate fault finding.
- Measurement of the XTU's head voltage and its internal temperature.

1.3 SPECIFICATION

Parameter	Specification	Remarks
Temperature (Max)	350ºF (177°C)	
Pressure (Max)	15,000psi (103.4MPa)	
Diameter	$1^{11}/_{16}$″ (43mm)	
Make-Up Length	19″ (483mm)	
Shipping Length	22.77″ (579mm)	Including thread protectors.
Weight	7.5lbs (3.4kg)	
Operating Voltages:		
Range	+180-400V DC	
Absolute Max	+600V DC	Max. 10secs.
Current consumption at 200V	20mA (No Load) 28-30mA (running SCT)	
Ultrawire Toolbus Current at Ambient (Max)	1.5A	
Ultrawire Toolbus Current at 177°C (Max)	1A	
End threads (top/bottom)	$1^{3}/_{16}$ UNF	female/male
End connectors (top/bottom)	4mm Banana single conductor	pin/socket
Tools allowable on toolbus	62	Subject to power requirements.
Ultrawire toolbus data rate	500kbits/s	
Ultralink uplink data rates	50, 71, 100, 143 & 200kbits/s	
Ultralink downlink rate	300bits/s	

2 SAFETY

2.1 GENERAL

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.

Liquid O-ring

LOR101 is used for lubricating the tool during maintenance. Contact with skin or eyes can be harmful. For more details, refer to the Material Safety Data Sheet for Liquid O-ring.

2.2 HIGH VOLTAGE

Warning!

High voltages (600V) are present at the Top Connector, Bulkhead Mounted Components and on the PSU Board.

If power is applied when removed from the Housing, care should be taken not to touch exposed HV components. Test probes should only be moved when the line power is off.

2.3 ELECTRO STATIC DISCHARGE

Caution!

Electro Static Discharge (ESD)

All tools with electronic boards that contain solid state circuits (transistors, diodes, semiconductors) may become damaged when contacted with an electrostatic charge.

When handling tools, which contain electronic parts that are ESD sensitive, the following guidelines should be followed to reduce any possible electrostatic charge build-up on the user's body and the electronic parts:

- Always ensure proper ESD precautions are taken when handling electronic parts that are ESD sensitive during maintenance.
- Avoid touching the tool electronics, unless stated otherwise in this manual.

Note that ESD is less likely to affect tools when the housing is fitted.

3 THEORY OF OPERATION

3.1 BLOCK DIAGRAM

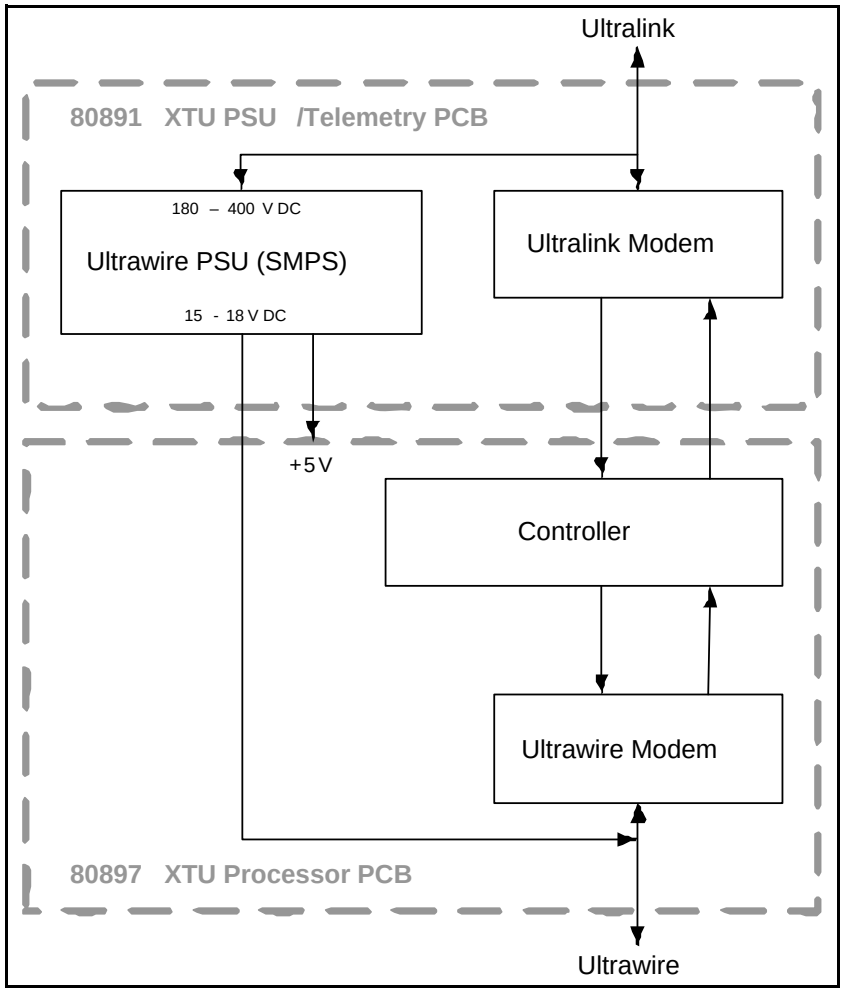


Figure 3.1 Block Diagram XTU

3.2 DESCRIPTION

The XTU Telemetry Controller consists of 4 main functional blocks as shown in the block diagram.

3.2.1 PSU

The PSU is a switched mode power supply, which steps down the high voltage DC on the Ultralink™ line to provide for local power requirements and to power the Ultrawire™ toolstring.

3.2.2 CONTROLLER

The Controller is responsible for controlling communication and logging activities on the Ultrawire™ toolbus and for sending data to the surface system via the Ultralink™ Telemetry System. A full duplex downlink allows the user to configure and control operation from the surface prior to and during logging.

Control is exercised by means of commands, which may be executed by the controller, or passed to other tools via the toolbus. Where command execution generates a response, this is generally uplinked to the surface via the Ultralink™. Commands may originate from the surface or from the logging program, which runs on the local CPU.

3.2.3 ULTRALINK™ MODEM

The Ultralink™ Modem forms the hardware interface between the controller and the e-line mono-cable, which carries data to and from the surface system. Uplinks are modulated onto the line as AMI (alternate mark inversion) at selectable bit rates of 50, 71, 100, 143 and 200kbits/s with amplitude of 5V (nom. pk.). The Ultralink™ uplink is synchronous. It maintains bit, word and frame lock at all times by transmitting NULL Frames whenever there is no active data traffic. Downlinks at 300bits/s are asynchronous AMI, with amplitude of 8V (typ). The Ultralink™ is full duplex so the uplink is not disturbed during a downlink.

3.2.4 ULTRAWIRE™ MODEM

The Ultrawire™ Modem forms the hardware interface between the controller and the Ultrawire™ toolbus. The single pin bus carries power to the tool in addition to its telemetry function. The return for both power and signal is via the chassis. Telemetry is modulated onto the line as 1V AMI (alternate mark inversion) at 500kbits/s. Ultrawire™ is a half-duplex master slave protocol. The controller, which is always the master, sends a command to the toolbus. This may be a global command (to all tools) or a tool specific command, which contains the address of the target tool. Tool specific commands are acknowledged by the tool. Global commands are executed, but do not generate a response. Both command and response packets may optionally carry attached data, following the header word.

4 OPERATING PROCEDURE

4.1 PRE-LOGGING CHECKS

4.1.1 MECHANICAL

Ref.: XTU002 General Assembly 09532

Clean and grease lower O-ring seals. Replace O-ring (item 10, 11 & 12) if damaged.

Ensure that upper and lower electrical connectors are clean, dry and undamaged.

4.1.2 ELECTRICAL

Using a Multimeter, check the Current Consumption @200V. The readings should be as follows:

- 18mA ±2mA (no tools connected below).
- 25-35 mA for a typical PL toolstring.

Using a Multimeter, check the voltage out at lower connector. The readings should be 16.7V ±0.5V.

4.1.3 OPERATING

The XTU002 must be operated as part of a compatible telemetry and logging system, such as the Sondex ULP (Ultralink™ Logging Panel) together with the Warrior logging system. Only Sondex Ultrawire™ compatible tools can be logged, using the XTU controller. However compatibility features are available to allow alternative telemetry protocols to co-exist on the toolbus.

The logging system may be tested with a dummy cable in place of a real cable. It is not recommended that the XTU002 is connected directly to the Ultralink™ Surface Panel.

4.2 CONNECTING TO TOOLSTRING

The XTU telemetry controller must be connected above the top Ultrawire™ tool. Up to 62 Ultrawire™ tools may be connected below it, provided that maximum toolbus currents are not exceeded. Upper and lower tool joint O-rings and seal surfaces should be clean, undamaged and lightly greased.

Note: An GO-Sondex Adapter is supplied with the tool.

Centralisers: The tool does not require any centralising.

4.3 LOGGING

The XTU002 may be operated over a wide range (120 - 400V) of input voltage though the PSU will not start until the head voltage reaches about 170V.

The optimum head voltage will depend on the cable and the tools in the string, but in general the aim should be to keep the line current to a reasonable level. A typical PL string on standard $^{7}/_{32}''$ cable should be run at about 200V. If the line current exceeds 100mA, then it is preferable to increase the voltage to keep the current to a minimum. Low power strings, such as the Sondex Short Compact Toolstring (SCT), may be run at voltages as low as 120V.

The voltage at the tool head is sensed and sent to the surface to facilitate setting the appropriate operating voltage.

Default Operation

The Ultralink™ uplink bit rate will default to 50kbits/s on power up. The controller will commence delivering NULL frames to the surface within a few seconds to allow the surface system to synchronise. Toolstring configuration is plug and play and configuration of the default logging program is fully automatic. The XTU polls the toolstring to determine which tools are present and then builds a tool table and a logging program. Information on the toolstring and the logging program is sent to the surface in a set of configuration frames. The default logging program shares the available bandwidth between the detected tools and will be an appropriate program for a majority of logging operations. However, for specialized requirements, an alternative user generated logging program may be downloaded from the surface system.

Once configuration is complete, the controller will send configuration frames continuously for a period of one minute, unless the surface system initiates logging by sending a start polling command. After one minute, the controller will automatically enter logging mode and execute the default logging program. This will typically consist of a repetitive loop, composed of the following commands.

Accept Timestamp	(Global)
Sample Now	(Global)
Tool Specific Send Data	(Adr = lowest tool address)
Tool Specific Send Data	(Adr = next tool address)
:	
:	
Tool Specific Send Data	(Adr = highest tool address)

Execution of this loop will cause Main data frames to be uplinked to the surface. Each main data frame will contain a timestamp indicating the time at which the Sample Now command was issued and the data returned by each of the tools in the string.

If the toolstring contains more complex tools, which deliver large data sets (>27 words) or have sampling latency grater than about 100μs, a secondary polling table will be created for these tools. Secondary data frames containing the response from a single secondary loop tool will then be alternated with Main data frames. This ensures that simple rate-meter tools are polled sufficiently frequently without being squeezed out by slow or bandwidth hungry tools. The program will cycle through secondary tools, skipping those that return ‘Not Ready’ when polled.

The operation of the telemetry may be monitored by the surface logging system, which will usually support a telemetry monitor window. Errors are detected and reported to the surface system and may be displayed or logged.

Operator Control

Commands may be sent from the surface to exercise user control of the XTU002 or any of the Ultrawire™ tools on the string. Although the Ultralink™/Ultrawire™ protocol supports a large set of commands, only a few are likely to be required for standard production logging runs. The surface system will give the user access to an appropriate sub-set of the possible commands. These will include as a minimum, commands to start and stop logging and to change the bit rate on the Ultralink. If power is cycled, the XTU controller will rebuild the configuration and then deliver Config frames for one minute. These can be skipped by sending the Start Polling command to the controller. Commands are ignored during configuration, therefore the operator should wait until Config frames are indicated before sending commands.

The bit rate may be changed by sending a 'Bit Rate' command to the controller. The new bit rate will be retained until either the operator modifies it again or until a 'health timeout' (see below) occurs. In the event of a health timeout, the bit rate will default to 50kbits/s, unless the operator has set a higher default bit rate by sending the 'Default Bit Rate' command.

The XTU controller monitors the health of the Ultralink™ downlink. To allow this to happen in the absence of operator intervention, the surface system will normally send a NULL command on the downlink at least once a minute. When no commands are received from the surface, the controller will generate a health timeout. This will cause the uplink bit rate to revert to the default bit rate and also cause the controller to transmit Config frames to the surface at regular intervals. If the downlink is restored, transmission of Config frames will cease, but the default bit rate will be retained until the operator once again changes it.

A PRT sensor is located within the Electronics Chassis to monitor the internal temperature, which should not be allowed to rise above 200°C (392°F).

Logging Speed

The following are guidelines only and must be used in conjunction with local policy and specific well site conditions both downhole and at surface. The table below is appropriate for near vertical wells and must be adjusted accordingly when in deviated wells. Use of a Head Tension Unit is highly recommended.

Note: Do not exceed the calculated safe working load of your selected weakpoint. If in doubt, use a head tension unit, especially in deviated wells where calculation from surface tension is less accurate.

Depth (ft)	Speed Pulling Out of Hole	Speed Running in Hole
In/out of catcher (pressure rig up only)	Dead slow or manual.	
30 to 150	30ft/min	
150 to 400	60ft/min	
>400 clear cased hole	Surface tension not to exceed 120% of tension when tool stationary. Speed not to exceed 150ft/min.	Surface tension should not be less than 80% of tension when tool stationary. Speed not to exceed 150ft/min.
>400 clear open hole	Surface tension not to exceed 130% of tension when tool stationary. Speed not to exceed 150ft/min.	Surface tension should not be less than 70% of tension when tool stationary. Speed not to exceed 150ft/min.
Approaching potential obstacles[a]	30ft/min	
Logging Data	**Do not exceed the above speeds.** Recommended speed is <30ft/min.	

a. For example: Reduced diameters, gas lift mandrels, fluid levels, valves, tubing shoes, packers, cross overs and other downhole equipment.

4.4 POST LOGGING DISASSEMBLY

The toolstring should be cleaned before disassembly.

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

Refit thread protectors immediately after disassembly to prevent damage.

4.5 TRANSPORT, HANDLING & STORAGE

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

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

5 MECHANICAL DESCRIPTION

The principal elements of the XTU002 telemetry controller are:

- Pressure Housing.
- Electronics Cartridge, containing a PSU/Telemetry PCB and a Processor PCB.

The upper and lower joints are standard Sondex mono-conductor connectors.

5.1 DISASSEMBLY

5.1.1 ELECTRONICS SECTION

Ref.:	General Assembly	*09532*
	Electronics Assembly	*80893*
	Electronic Chassis Assembly	*10589*

1 Unscrew Pressure Housing (item 1, 09532) from Electronics Assembly (item 3, 09532).

Note: The Electronics section internal chassis is hard wired to the Lower Sub (item 18, 80893) and remains fixed by Grub Screws (3x item 9, 10589).

2 To access the Electronics boards, remove Screws (item 6, 10589) and remove the top Cover (item 1, 10589).

Caution!

Hardwired Electronics Assembly:
The PSU/Telemetry PCB is soldered into the Electronics Assembly and mounted to the Heatsink. Sondex advises not to service the Electronics boards, but to return to Sondex for repair. Failing to disassemble/reassemble the tool without proper knowledge of the build, may cause the tool to become inoperable.

Note: The lower Cover forms an integral part of the chassis and should not be removed.

5.1.2 LOWER SUB

Ref.:	Electronics Assembly	*80893*
	Electronic Chassis Assembly	*10589*
	Lower Connector Assembly	*10057*

Note: All item numbers in this section refer to drawing 80893, unless stated otherwise.

1 Remove Circlip (item 21) to extract the Lower Sub Connector Assembly (item 19).

2 Unsolder the wire, attached to the special nut, from the PCB.

3 It is generally not necessary to separate the Lower Sub from the Chassis, but if required, screw Grub Screws (3x item 9, 10589) inwards.

Note: This will release the Lower Bulkhead (item 2, 10589) from the Lower Sub (item 18). Note the split wavy washer (item 43) between the Lower Sub (item 18) and the Electronics Chassis (item 1).

5.2 SERVICING PRESSURE ISOLATION HEAD

Ref.: Electronics Assembly *80893*
Electronic Chassis Assembly *10589*
Wiring Diagram XTU Chassis Assembly *WD-80893*

Note: All item numbers in this section refer to drawing 10589, unless stated otherwise.

For disassembly and maintenance of the Pressure Isolation Head (item 4), refer to *MN-PIH*.

Note that Upper Electronics Bulkhead (item 4) also forms the upper section of the PSU heatsink assembly and is filled with heatsink compound (item 44, 80893). If the PIH needs servicing, the Upper Electronics Bulkhead Assembly (item 4) should carefully be removed from the Bulkhead Heatsink (item 3) by removing Screws (2x item 6) and disconnecting the yellow line wire from the PCB. The Heatsink Compound must then be cleaned from inside the Upper Electronics Bulkhead before it is disassembled. New heat sink compound should be applied to fill all voids on reassembly.

4 Ensure that the pressure isolation head (item 4) has been fully reassembled to the chassis.

5 Ensure that the 'hard wired' connection from the Pressure Isolation Head has been restored to the Electronics Assembly as indicated on WD-80893.

5.3 REASSEMBLY

5.3.1 LOWER SUB

Ref.: Electronics Assembly *80893*
Electronic Chassis Assembly *10589*
Lower Connector Assembly *10057*

Note: All item numbers in this section refer to drawing 80893, unless stated otherwise.

1 Inspect all wires for damage and replace if necessary.

2 Clean and grease the O-ring seals. Replace O-ring (item 23) and O-ring (item 6, 10057) if required.

3 Ensure all inner spaces are free from dirt and/or debris.

4 If the Lower Sub (item 18) has been removed from the Electronic Chassis (item 1), replace it as follows:

i. Check Wavy Washer (item 43) is fitted over the line wire.
ii. Re-assemble the Electronic Chassis to the Lower Sub (taking care not to trap and/or damage the wire).
iii. Rest the Lower Sub on a firm surface and apply a firm downward pressure to the Electronic Chassis so as to compress the Wavy Washer.
iv. Whilst the Washer is compressed, the Grub Screws (item 9, 10589) can be backed out to secure the Electronic Chassis in the Lower Sub. It is important that the Screws are backed out firmly.
v. Refit the Lower Sub Connector Assembly (item 19) in the Lower Sub item 18). Secure the Lower Sub Connector Assembly (item 19) with Circlip (item 21).

Note: Ensure Lower Sub Connector Assembly (item 19) seats correctly against Anti-rotation Pin (item 20).

vi. Check that the Pressure Housing can be fitted easily. It may be necessary to adjust the alignment of the Lower Sub on the Electronic Chassis by slightly releasing one or two Grub Screws and then backing out the others to retighten the joint.

5.3.2 ELECTRONICS

Ref.:	General Assembly	*09532*
	Electronic Chassis Assembly	*10589*
	Wiring Diagram XTU Chassis Assembly	*WD-80893*

Note: All item numbers in this section refer to drawing 09532, unless stated otherwise.

1 If the Electronics Boards were previously accessed, ensure:

- Top Cover (item 1, 10589) is properly refitted and secured with Screws (item 6, 10589).

2 Check the Upper and Lower Connectors for damaged contacts.

3 Check for damaged and crushed wires.

4 If the chassis mounted transistors/diodes have been removed or replaced, they should be re-fitted with the insulators as shown in WD-80893.

5 Clean and grease the O-ring seals. Replace the O-rings (2x item 10, 2x item 11 & 1x item 12) if required.

6 Clean the pressure seal surfaces at both ends of the Pressure Housing (item 1). Ensure that the housing is free from debris.

7 Ensure that the electronics assembly is free from any dirt and/or debris.

8 Screw Pressure Housing (item 1) onto Electronics Assembly (item 3).

6 ELECTRICAL DESCRIPTION

Ref.: Wiring Diagram XTU Chassis Assembly *WD-80893*

6.1 PROCESSOR CIRCUIT BOARD

Ref.: Processor Circuit Diagram *CD-80897*

Controller (Sheets 1 & 3)

The XTU Processor Board comprises a micro-controller (U8), an FPGA (U6), and two FIFOs (U5 and U4) together with associated glue logic. The clocks are derived from a crystal oscillator (X1), with 16MHz and 4MHz TTL level outputs.

U5 buffers data from the Ultrawire™ uplink whilst the controller decodes the control fields and checks for data integrity. The MPU then passes the data to U4 where it is held until the Ultralink™ modulator (also implemented in the FPGA) collects it for transmission to the surface.

Ultrawire™ Telemetry Interface (Sheet 2)

The drivers and receivers for the Ultrawire™ telemetry are also in this board. Q1 and Q2 form the drivers and U1, together with associated passive components, is the receiver. Q1 and Q2 are driven directly by the Ultrawire™ modulator circuits in the FPGA and the detected uplink from U1 is also passed to the FPGA, which handles toolbus demodulation.

Figure 6.1 shows a typical Ultrawire™ signal as seen on the bottom connector of the tool.

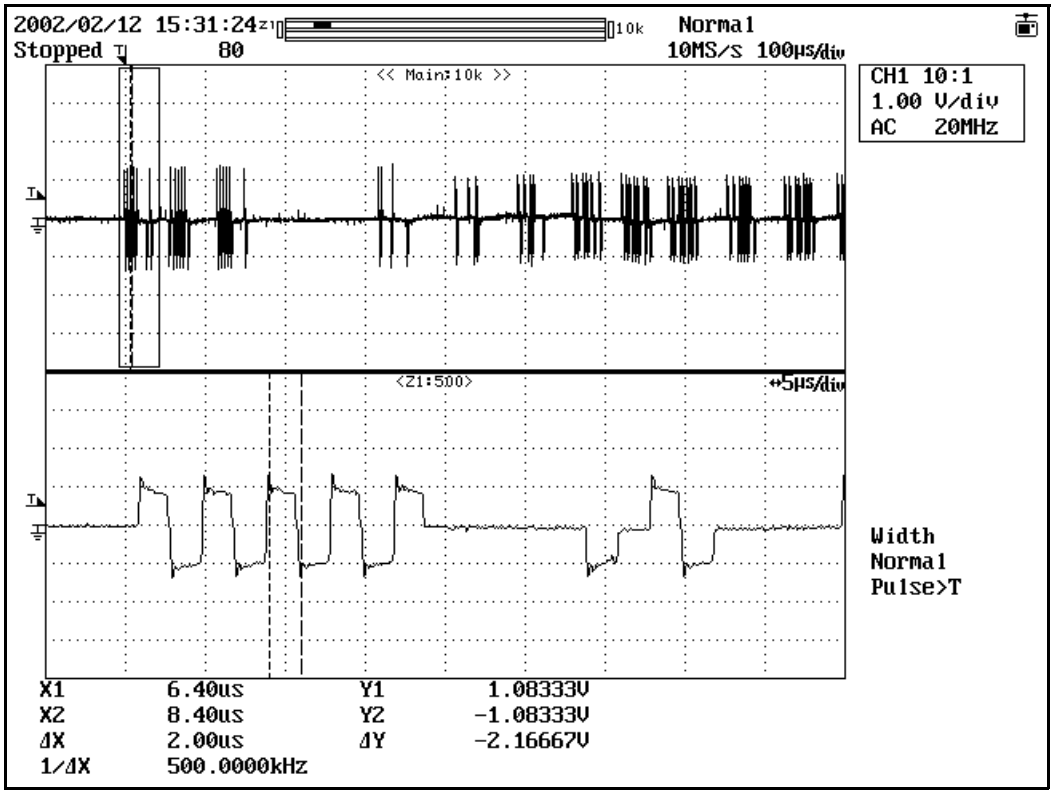


Figure 6.1 Ultrawire™ Signal Shape example

6.2 PSU/TELEMETRY BOARD

Ref.: PSU/Telemetry Circuit Diagram *CD-80891*

PSU Circuit (Sheet 1)

The PSU is a fly-back SMPS that steps down the high voltage DC at the tool head to provide low voltage rails for the XTU and power to the Ultrawire™ bus, from which the other logging tools are powered. It is based around the Siliconix 9120 current mode controller (U1). Start-up power is provided via Q8 and U10. The primary winding of the transformer choke is switched by Q2. The secondary winding provides +16V nom., which powers the Ultrawire™ toolstring and the XTU. An auxiliary SMPS (U6) provides 5V and -16V for use locally in the XTU controller. The feedback for the SMPS controller is from the main +16V output. Over-current and over-voltage conditions at the output are detected and used to shut down the PSU.

Ultralink™ Telemetry Interface (Sheet 2)

The Ultralink™ uplink is driven onto the Ultralink™ line by U3, which is buffered by Q3 and Q4. U2 buffers the input to the driver, ensuring a clean symmetrical signal is provided to the buffer amp. A typical uplink signal as seen at the tool-head is shown in *Figure 6.2*.

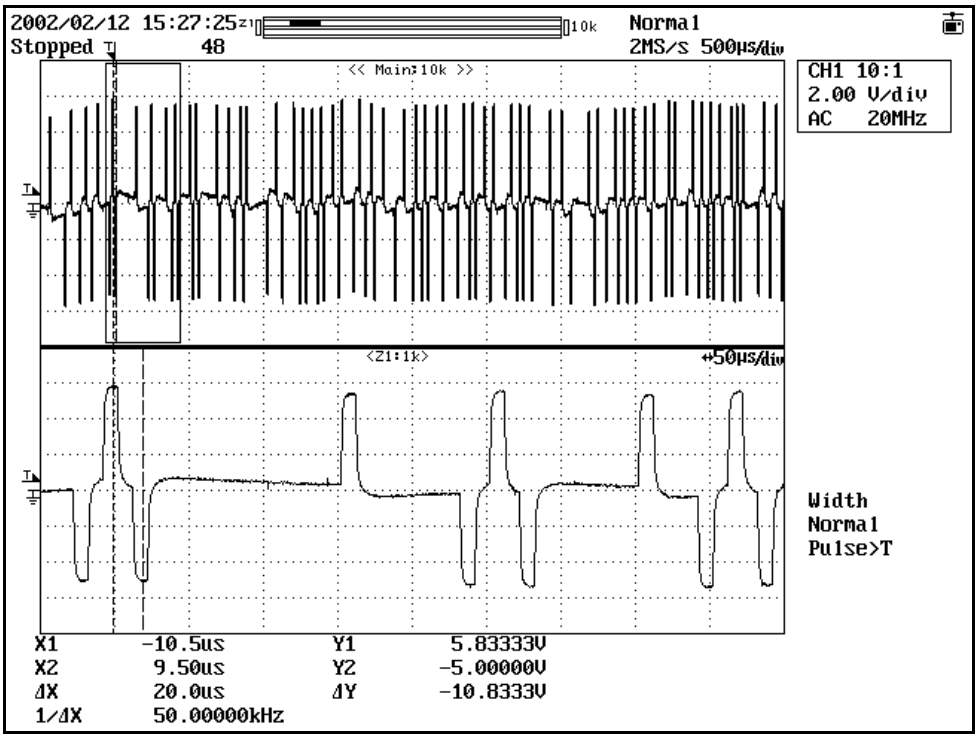


Figure 6.2 Ultralink™ Uplink Signal

The downlink is recovered by a set of filters comprising U4 and U7 with associated components. The recovered AMI at TP21 is demodulated into 5V NRZ by U5 and associated components, and passed to the serial input of the processor. The recovered downlink at TP21 is shown in *Figure 6.3*.

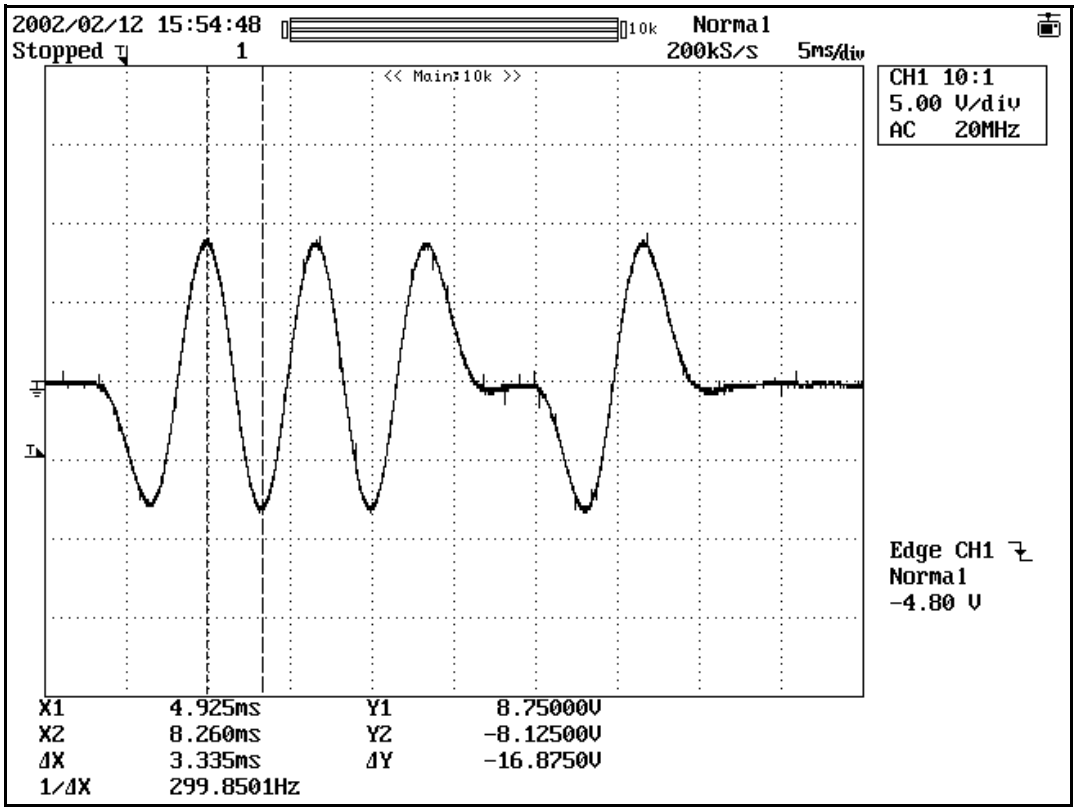


Figure 6.3 Recovered downlink at TP21

7 EXTENDED CHECKS

See also *4.1 Pre-Logging Checks*

7.1 PREVENTATIVE MAINTENANCE

7.1.1 GREASE & LUBRICANTS

Sondex recommends the use of “Liquid O-ring type 101” (p/n LOR101) on threads and O-rings.

All O-rings and housing threads are assumed to be and must be lightly greased, unless specifically indicated otherwise.

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

Note that some threads are internal, which can cause grease to 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 for grease are not suitable for use on O-rings. Silicone grease may be used on O-rings, but must be kept clear of threads, especially stainless steel to stainless steel.

Caution! The use of certain greases, which contain volatile content, (e.g. some types of Lubriplate) can cause electrical failure due to production of corrosive gasses inside the tool when burned off.

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.

Note: Sondex recommends to replace O-rings after every run or every 3 months, whichever comes first.

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 secure 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.

7.1.3 ELECTRICAL

1 Check current consumption at 200ºC: 18 ±2mA (no tools connected below).

2 Voltage out at lower connector: 16.7V ±0.5V.

3 Connect to Logging System and check for correct data. Apply gentle vibration and rotation to expose potential failure.

7.1.4 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. Life of the electronics 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 that 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 afterwards subjected to moderate vibration. A moderately hard blow from a wooden hammer is recommended.

DO NOT USE METAL HAMMERS.

7.1.5 HEAT TESTING ABOVE 150°C

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

Heat testing may be required for contractual reasons, tool out of use for a long period, or job with unusually high well temperature. The test should be carried out slightly above expected well temperature only and the tool should not be kept at temperature for more than 1 hour.

7.2 EXTRAORDINARY MAINTENANCE

7.2.1 O-RING REPLACEMENT

Ref.: General Assembly *09532*

Note: During the reassembly process, inspect all O-ring seals for any signs of wear or damage and replace with new seals where necessary.

If the tool experiences H_2S gas or temperatures above 150°C, then the following O-rings must be replaced:

- 2x item 10.
- 2x item 11.
- 1x item 12.

No other special maintenance is required.

7.3 TROUBLESHOOTING

Refer to *Section 5* and *Appendix B* where necessary.

An Oscilloscope, Multimeter and other basic test equipment will be required.

Initial inspection	Check for: • Damaged wires. • Damaged components. • Electrical components shorting to chassis. • Heat or chemical damage (discoloured components). • Incorrect thread grease or excessive quantity, see *7.1.1*. Also check all fixings are tight.
Excessive input current	Disconnect any tools below the XTU002. Apply power slowly to top connector and monitor current. If current increases above 5mA before i/p reaches 80V, check for short circuits or faulty Power MOSFET, (Q2). Q2 is mounted on the top bulkhead of the tool. Disconnect +5V (red) and +16V (purple) between the two PCBs and recheck current. Check voltage on PSU (80891) at: • TP11 16V nom. • TP24 5V nom. • TP16 -16V nom. If these voltages vary by more than 5%, replace or fault find PCB. Reconnect 5V to processor board (80897) via a milliammeter. PCB80897 should draw about 60mA. If it is drawing more than 100mA, check for short circuits on processor board. Check zener diode D3, which may have blown short if it has been subjected to over-voltage for an extended period.
Little or no current	Check that line volts appear on PSU (80891) at TP1. If not, fault find open circuit in top connector sub or wiring. Check for 12V at TP4 and 10V at TP3 and pin 12 of U1. If U1 pin 12 is oscillating, check for a short on the output or intermittent over voltage on TP11 (16V nom). Check for pulses on TP8. These should be 12V positive going at a rep rate of ~125kHz. Check for 16V at positive end of C5. Check for current pulses in primary winding on TP5. These should be skinny triangles of 100 - 300mV with no Ultrawire™ tools connected. If primary winding is pulsing and 16V is not present on C5, check wiring to D1 (mounted on heatsink).

No telemetry frames at surface	Check Ultralink™ line (centre pin at top of tool) for telemetry pulses as shown in *Figure 6.2*. If no pulses on line, check for TTL level negative going pulses on wiring points UUP* and UUN* (pink and white wires between PCBs). If pulses are present on UUP* and UUN* but not on tool head, fault is on PSU/Telemetry PCB (PCB80891). Fault find or replace PCB. Disconnect UUP* and UUN*. If no pulses are present on UUP* and UUN* at output of processor board, fault is on processor board (PCB80897). Check power rails and basic signals on processor board (80897): • CRES (U8 pin 18) Logic high. • SYSCLK (U8 pin 16) 8MHz clock. • X1 pin 1 16MHz clock. • X1 pin 2 4MHz clock. Fault find or replace board.
Config frames only at surface	After power up and configuration, the XTU002 will send Config frames for a period of 1 minute before entering logging mode and sending Main (and optionally Secondary) Data Frames. Transmission of Config frames can be terminated and logging started immediately by sending a Start Polling command from the surface.

Main data frames but no tool counts at surface when tools are connected	Check operation of toolbus. Monitor toolbus (bottom connector of XTU) with an Oscilloscope set to AC 1V/div, 5μs/div. and apply power. After 8-10 seconds, a brief burst of bipolar pulses (lasting less than 1 second) should appear on the bus. This is the plug and play configuration taking place. The bus will then go quiet for 1 minute (whilst Config frames are sent to the surface), after which the controller should enter logging mode and start polling the bus. If there is no bus activity, check 80897 at TP14 and TP15 for logic pulses generated by the FPGA. If there is activity on the bus, but one or more tools are not delivering data, the controller may have polled the tools during configuration but not seen a response. In that case, the tools will not have been entered in the logging program and hence will not be polled. Check for activity at R11 (input to receiver) and at U1 pins 1 and 7 (output from receiver). If there is no activity, or pulses are stunted or spiky, fault find or replace. Check also that the toolstring is properly terminated, either with an Ultrawire "Bullnose" or a bottom flowmeter containing a terminator. Termination problems are characterized by erratic configuration (sometimes the tool will work, sometimes not), and often by tool errors such as Ack or Data timeouts shown on the surface system's monitoring screen. On a long unterminated toolstring, the tools may never be configured. Check for ringing on the UW toolbus to confirm a termination problem.
No response to downlinks	With an Oscilloscope set to 5ms/div, 5V/div, check signal integrity of downlink on 80891 at TP12 (±8V, with Ultralink signal riding on top), TP20 (±6V) and TP21 (±8V). Check thresholds on TP22. These should switch between ±4V on each data pulse. Threshold should relax to -4V in absence of data. TTL level NRZ data should be evident at TP25 and can be traced to the H8 micro-controller (U8 pin 56) on 80897. Check that the bit period of the recovered data is 3.3ms. nom. Fault find or replace PCB as appropriate.

APPENDIX A EQUIPMENT & RECOMMENDED SPARES

Item	Part No.	Description	Qty	Remarks
1	XTU002	Downhole Telemetry Controller	1	

A.1 ANCILLARY EQUIPMENT

Item	Part No.	Description	Qty	Remarks
1	AGS001	GO to Sondex Adapter		Part of the Assembly.

A.2 MAINTENANCE EQUIPMENT

Item	Part No.	Description	Qty	Remarks
1	*91050*	Hand Tool Kit for $1^{11}/_{16}$″ tools		
2	LOR101	Grease for O-rings and threads	AR	5oz pot
3	LOR101L	Grease for O-rings and threads	AR	16oz pot
4	A078-S35SL	Silicone Compound	AR	

A.3 RECOMMENDED SPARES

Item	Part No.	Description	Qty	Remarks
1	*KITB-XTU*	Basic Spares Kit	1	To support 1 run in hole.
2	*KITR-XTU 1_11/16*	Recommended Spares Kit.		Supports 25 runs in hole.
3	*KITRem-PIH, SX*	Remote Spares Kit for Pressure Isolation Head.	1	See Pressure Isolation Head Manual *MN-PIH*.

All spares kits, mentioned in this section, can be supplied upon request. However, Sondex recommends the purchase of these kits to properly support your logging tools from job to job. Contact Sondex and quote the part number of the spares kit for additional information or when ordering the spares kit.

As a guidance:

- A Basic Spares Kit mainly contains essential maintenance equipment, O-rings and parts, which are likely to need replacing on a run-by-run basis (including spare parts for the initial tool run) or parts that can be lost easily (like grub screws).
- A Recommended Spares Kit has got a multitude of the same parts as a Basic Spares Kit, supplemented by parts that might need replacement at a lower frequency, i.e. 5 runs and/or 25 runs.
- Spares Kits, suitable for remote logging operations, can be supplied upon request.

Note that the information above is a guidance only and Sondex reserves the right to change the contents of the Spares Kits as required.

Note: Spares kits suitable for remote logging operation can be supplied upon request.

PARTS LISTING

Part:	Issue:		Drawn:	Checked:	Approved:
91050	B		NGH	PD	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

Iss	Date	Remarks	Chkd	Appr
-	14/01/2002	Initial Release	PD	DJF
A	11/04/2006	ECR 3697 Refers - Item 018, p/n 91822 added	JC	JC
B	25/05/2006	ECR's 3721 & 3789 refer-Item 002, qty was 1 off, item 019 added	JC	NPB

RELATED DOCUMENTS

# Documents	Issue	Notes

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		2	ea	
003	10038	A	Spanner Box 3/8 x 5/16 Modified		2	ea	
004	91028	-	Spanner O/E 3/8x5/16		1	ea	
005	91027	-	Spanner Single Open End 18mm		1	ea	
006	91029	-	Key, Hex Metric (Set)		1	ea	
007	91030	-	Punch Pin Parallel set		1	ea	
008	00615	A	Assy Spanner PKJ		1	ea	
009	91293	-	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	
018	91822	-	Medium Flat Blade Screwdriver, 5mm		1	EACH	
019	91255	-	T15 Torx driver, Sandvik Belzer 8915		2	ea	

(AR = As Required)

PARTS LISTING

Part:	Issue:		Drawn:	Checked:	Approved:
KITB-XTU	-		SBE	PGJ	PS
			Date: 27/02/2002	Date: 27/02/2002	Date: 27/01/2005

Description:
Kit, Spares, Basic, XTU

CHANGE HISTORY

Iss	Date	Remarks	Chkd	Appr
-	27/01/2005	1st Issue	PGJ	PS

RELATED DOCUMENTS

# Documents	Issue	Notes

PARTS LIST

Item	Part No.	Issue	Description	Component Value	Qty	Units	Remarks
001	99211	-	O-ring 211 Viton 90		2	ea	
002	99124	-	O-ring 124 Viton 90		2	ea	

(AR = As Required)

PARTS LISTING

Part:	Issue:		Drawn:	Checked:	Approved:
KITR-XTU 1_11/16	A		DMO	PS	PS
			Date: 02/02/2004	Date: 21/01/2005	Date: 21/01/2005

Description:
Kit, Spares, Recommended (25 run) XTU 1_11/16

CHANGE HISTORY					RELATED DOCUMENTS		
Iss	*Date*	*Remarks*	*Chkd*	*Appr*	*# Documents*	*Issue*	*Notes*
A	21/01/2005	Initial release.	PS	PS			

PARTS LIST

Item	*Part No.*	*Issue*	*Description*	*Component Value*	*Qty*	*Units*	*Remarks*
001	99211	-	O-ring 211 Viton 90		50	ea	
002	99124	-	O-ring 124 Viton 90		50	ea	
003	95211	-	O-ring 211 Viton 75		5	ea	

(AR = As Required)

PARTS LISTING

Part:	Issue:		Drawn:	Checked:	Approved:
KITRem-PIH,SX	A		RLH	RLH	RLH
			Date: 30/04/2001	Date: 30/04/2001	Date: 30/04/2001

Description:
Kit, Spares, Remote(25Run), PIH Isolation Hd(Base), SX

CHANGE HISTORY					RELATED DOCUMENTS		
Iss	*Date*	*Remarks*	*Chkd*	*Appr*	*# Documents*	*Issue*	*Notes*
A	--/--/--						

PARTS LIST

Item	*Part No.*	*Issue*	*Description*	*Component Value*	*Qty*	*Units*	*Remarks*
001	01028	C	Assy, Banana Pin (4mm)		1	ea	
002	10031	A	Nut Locking		1	ea	
003	10032	A	Insulator Clamp		1	ea	
004	10035	C	Assy Pin Connector Isolation Head SX		1	ea	
005	92030	-	Connector Pressure Isolation Mono Short		1	ea	
006	95008	-	O-ring 008 Viton 75		1	ea	
007	95011	-	O-ring 011 Viton 75		1	ea	
008	95111	-	O-ring 111 Viton 75		1	ea	

(AR = As Required)

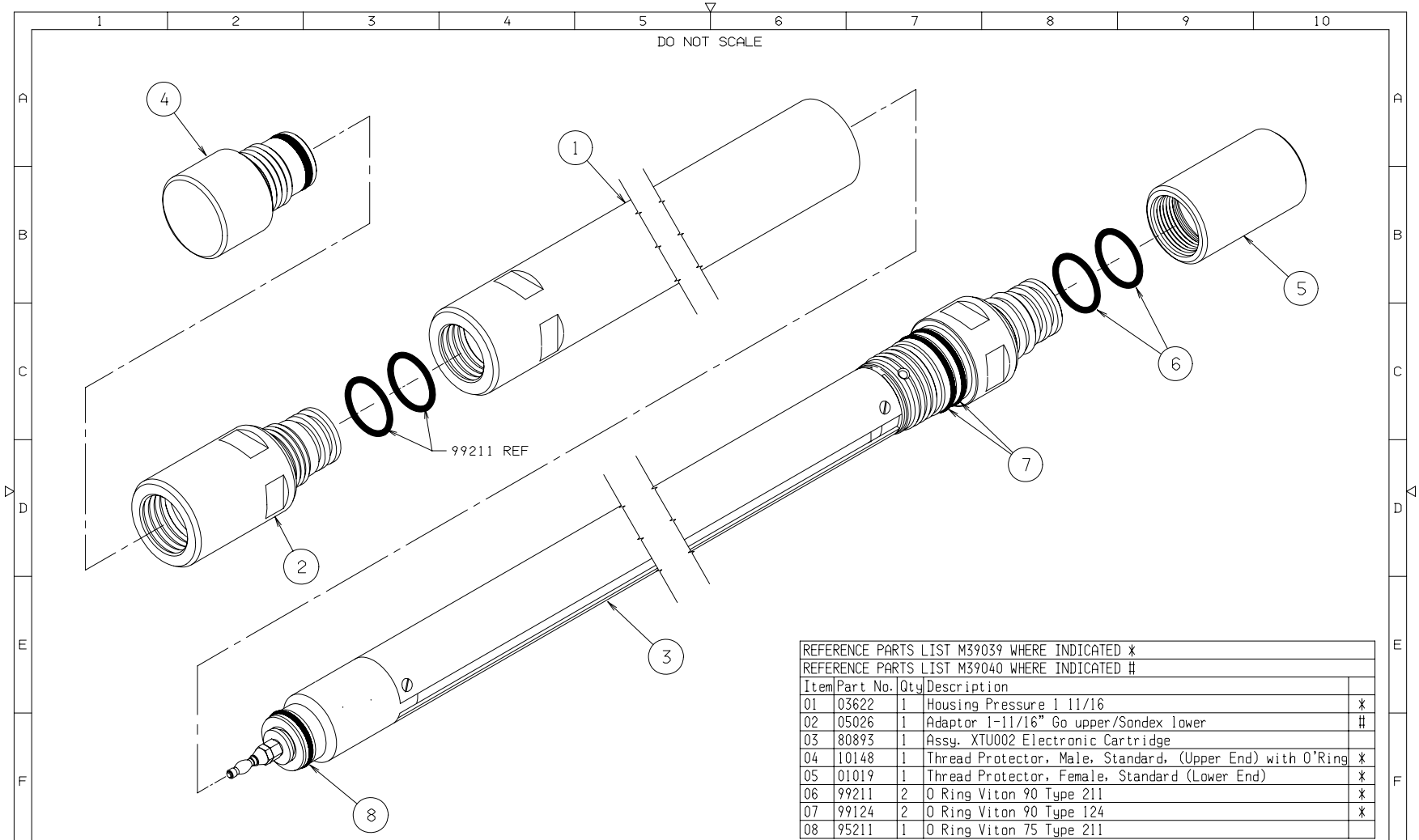
APPENDIX B DRAWINGS & PARTS LISTS

B.1 MECHANICAL DRAWINGS

Description	Drawing	Parts List
XTU002 General Assembly	*09532-B*	Shown on drawing.
Electronics Assembly	*80893-C*	*80893-B*
Electronic Chassis Assembly	*10589-A*	*10589-B*
Lower Connector Assembly	*10057-D*	*10057-D*

B.2 ELECTRONIC DIAGRAMS

Description	Type	Drawing
XTU Chassis Assembly	Wiring Diagram	*WD-80893-C*
PSU/Telemetry Board (2 sheets)	Circuit Diagram	*CD-80891-P*
Ultrawire™ Processor Assembly (3 sheets)	Circuit Diagram	*CD-80897-D00x*



REFERENCE PARTS LIST M39039 WHERE INDICATED ✱				
REFERENCE PARTS LIST M39040 WHERE INDICATED ♯				
Item	Part No.	Qty	Description	
01	03622	1	Housing Pressure 1 11/16	✱
02	05026	1	Adaptor 1-11/16" Go upper/Sondex lower	♯
03	80893	1	Assy. XTU002 Electronic Cartridge	
04	10148	1	Thread Protector, Male, Standard, (Upper End) with O'Ring	✱
05	01019	1	Thread Protector, Female, Standard (Lower End)	✱
06	99211	2	O Ring Viton 90 Type 211	✱
07	99124	2	O Ring Viton 90 Type 124	✱
08	95211	1	O Ring Viton 75 Type 211	

DRAWN	CHECKED	APPROVED
GPW	NGH	TG
DATE 28/03/02	DATE 19/07/04	DATE 19/07/04
DIM IN INCHES	MATL: SEE DETAILED DRAWINGS	
SCALE NTS	A3	

ISS	DESCRIPTION	APPD	DATE
B	ECR 3769 REFERS - P/L ADDED, ITEMS RENUMBERED	GT	12/05/06
A	ECR's 2207 & 2233 REFER	SE	08/02/05
PT1	INITIAL RELEASE	TG	19/07/04

Sondex
Tel. 0118 932 6755

THIRD ANGLE PROJECTION

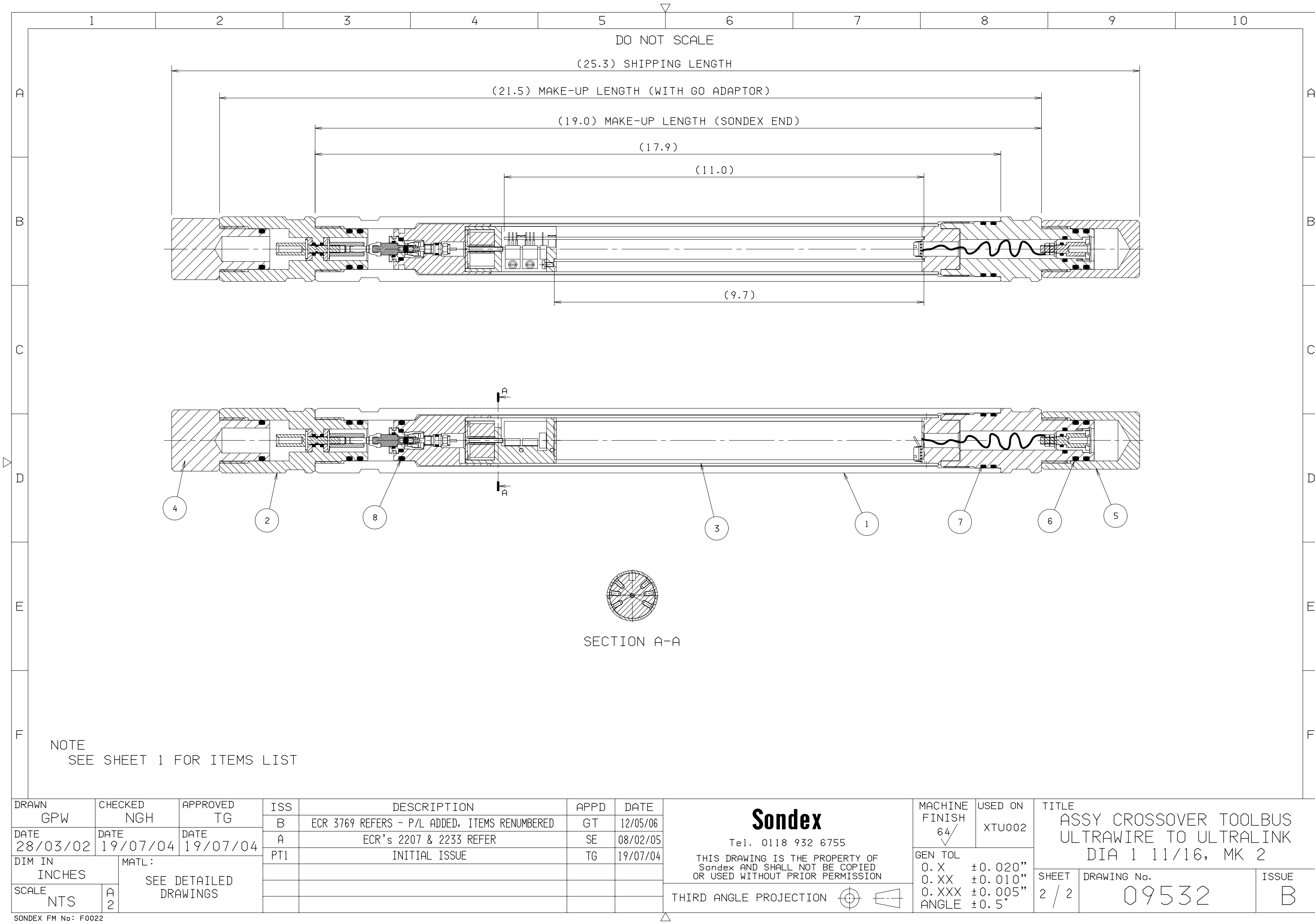
USED ON: XTU002

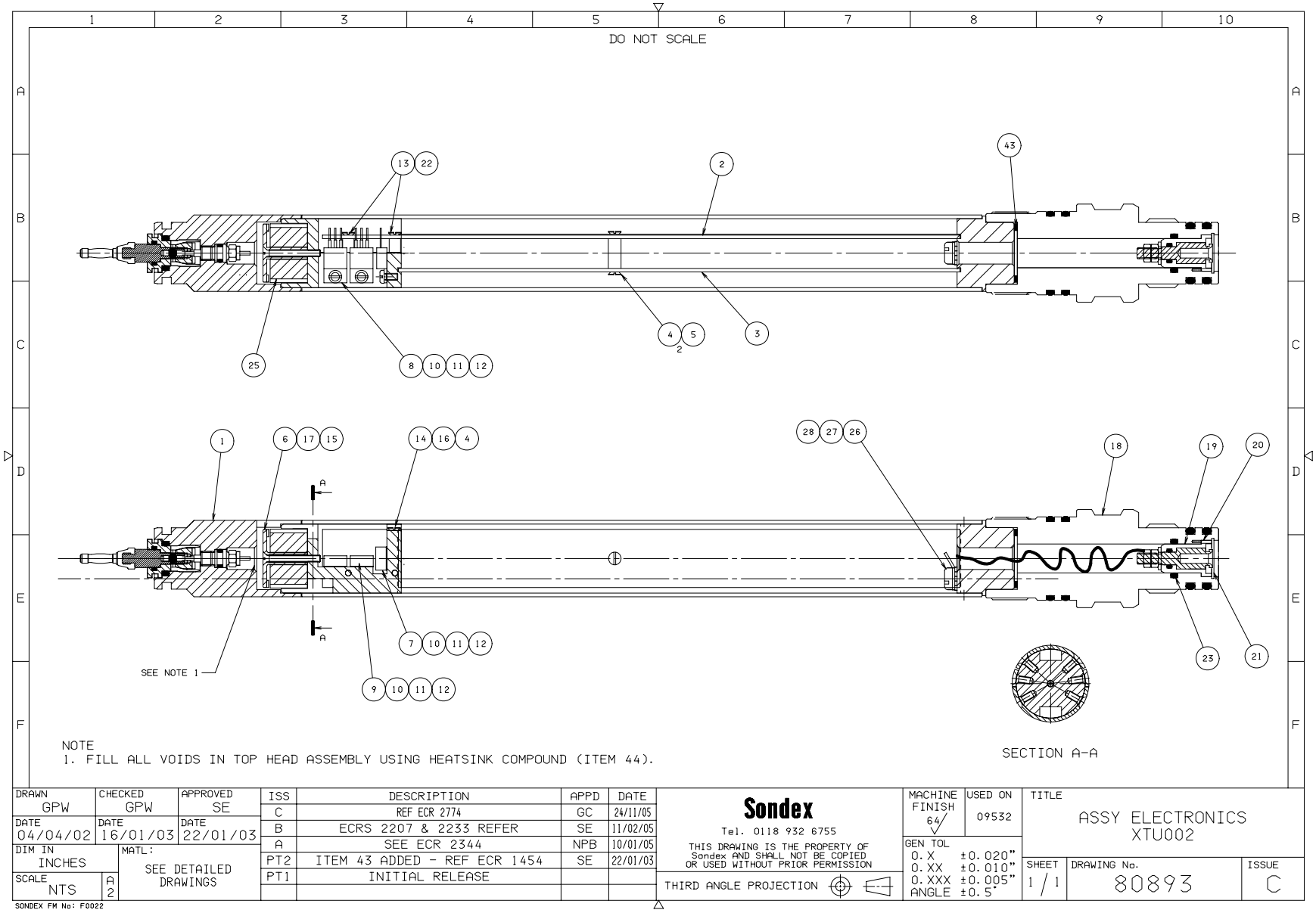
MACHINE FINISH 63

GEN TOL
0.X ±0.020"
0.XX ±0.010"
0.XXX ±0.005"
ANGLE ±0.5°

TITLE: ASSY CROSSOVER TOOLBUS ULTRAWIRE TO ULTRALINK DIA 1 11/16, MK 2

SHEET 1/2 | DRAWING No. 09532 | ISSUE B


DO NOT SCALE
(25.3) SHIPPING LENGTH
(21.5) MAKE-UP LENGTH (WITH GO ADAPTOR)
(19.0) MAKE-UP LENGTH (SONDEX END)
(17.9)
(11.0)
(9.7)
A
A
4
2
8
3
1
7
6
5
SECTION A-A
NOTE
SEE SHEET 1 FOR ITEMS LIST
DRAWN GPW
CHECKED NGH
APPROVED TG
DATE 28/03/02
DATE 19/07/04
DATE 19/07/04
DIM IN INCHES
MATL: SEE DETAILED DRAWINGS
SCALE NTS
A2
ISS
DESCRIPTION
APPD
DATE
B ECR 3769 REFERS - P/L ADDED, ITEMS RENUMBERED GT 12/05/06
A ECR's 2207 & 2233 REFER SE 08/02/05
PT1 INITIAL ISSUE TG 19/07/04
Sondex
Tel. 0118 932 6755
THIS DRAWING IS THE PROPERTY OF Sondex AND SHALL NOT BE COPIED OR USED WITHOUT PRIOR PERMISSION
THIRD ANGLE PROJECTION
MACHINE FINISH 64
USED ON XTU002
GEN TOL
0.X ±0.020"
0.XX ±0.010"
0.XXX ±0.005"
ANGLE ±0.5°
TITLE
ASSY CROSSOVER TOOLBUS ULTRAWIRE TO ULTRALINK DIA 1 11/16, MK 2
SHEET 2/2
DRAWING No. 09532
ISSUE B
SONDEX FM No: F0022



NOTE
1. FILL ALL VOIDS IN TOP HEAD ASSEMBLY USING HEATSINK COMPOUND (ITEM 44).

DRAWN	CHECKED	APPROVED
GPW	GPW	SE
DATE	DATE	DATE
04/04/02	16/01/03	22/01/03
DIM IN: INCHES	MATL: SEE DETAILED DRAWINGS	
SCALE: NTS	A2	

SONDEX FM No: F0022

ISS	DESCRIPTION	APPD	DATE
C	REF ECR 2774	GC	24/11/05
B	ECRS 2207 & 2233 REFER	SE	11/02/05
A	SEE ECR 2344	NPB	10/01/05
PT2	ITEM 43 ADDED - REF ECR 1454	SE	22/01/03
PT1	INITIAL RELEASE		

Sondex
Tel. 0118 932 6755

THIRD ANGLE PROJECTION

MACHINE FINISH 64	USED ON 09532
GEN TOL	
0.X ±0.020"	
0.XX ±0.010"	
0.XXX ±0.005"	
ANGLE ±0.5°	

TITLE: ASSY ELECTRONICS XTU002

SHEET	DRAWING No.	ISSUE
1 / 1	80893	C

PARTS LISTING

Part:	Issue:		Drawn:	Checked:	Approved:
80893	B		GPW	PS	SE
			Date: 04/04/2004	Date: 03/02/2005	Date: 08/02/2005

Description:
Assy. XTU002 Electronic Cartridge

CHANGE HISTORY				
Iss	Date	Remarks	Chkd	Appr
A	08/02/2005	ECRS 2207 & 2233 REFER	PS	SE
B	24/11/2005	ECR 2774	GC	NPB

RELATED DOCUMENTS			
#	Documents	Issue	Notes
02	WD80893	C	WIRING DIAGRAM
03	AI-80893	PT1	Assembly Instructions
04	AR-80893	PT1	ASSY RECORD

PARTS LIST

Item	Part No.	Issue	Description	Component Value	Qty	Units	Remarks
001	10589	A	Assy Chassis Electronics (Mech parts) XTU002 (Sondex end)		1	ea	
002	80897	C	Assy; XTU PROCESSOR; CIRCUIT DIAGRAM		1	ea	
003	80891	H	Assy; XTU002 PSU/TELEMETRY		1	ea	
004	93221	-	Screw Csk Hd sltd M3x6mm LG SS (Duplicate-Refer to 01029)		3	ea	
005	93261	A	Spacer Round M3 Thru 4.75mm OD x 12.7mm LG BNP		1	ea	
006	16513	PT3	TRANSFORMER CLAMP		1	ea	
007	D014-0200V	-	Diode, Power, Soft recovery, 8.0A, (DH, TH)	BYW29E-200	1	ea	
008	Q006-0F510	-	IRF510 N Channel Power MOSFET, 100V 5A6 43W (TH TO220)	IRF510	1	ea	
009	Q006-NB100	-	MOSFET, N-Channel, 1000V 3A 100W (TO220)	STP3NB100	1	ea	
010	Q101-00220	-	TO-220 Transistor Insulating Kit with Silicone Impreg Washer		3	ea	
011	Q100-00220	-	TO220 Transistor Insulating Kit with Mica Washer		3	ea	
012	93027	-	Screw Pan Hd Sltd M3 x 6mm LG BNP		3	ea	
013	93351	-	Screw Csk Hd M3 x 12mm LG SS		2	ea	
014	93097	-	Tag Solder M3		1	ea	
015	93414	-	Spring Wave, OD 25.3mm CrNi-steel		1	ea	
016	93028	-	Washer Serrated internal M3 SS (DIN6798J)		1	ea	
017	93594	-	Screw Csk Hd M3 x 25mm LG SS		1	ea	
018	10007	E	Sub, Lower, 1 11/16		1	ea	
019	10057	D	Assy Connector Lower SX Sealing Type		1	ea	
020	93019	-	Pin Spirol 1mm x 8mm LG MCK SS		1	ea	
021	01047	-	Circlip, Internal, 5/8, St/Steel		1	ea	
022	93953	-	Spacer Roung M3 x 6mm		2	ea	
023	95112	-	O-ring 112 Viton 75		1	ea	
024	C061-0390N	-	Capacitor, SV Series, HV MLC 1kV 10% (DH, TH)	390n/1kV	2	ea	
025	80892	C-01	Transformer/Choke, XTU Power Supply	80892	1	ea	
026	93234	-	Screw Pan Hd Sltd 10-32UNFx1/4 LG SS		1	ea	
027	93150	-	Tag Solder 10-32		1	ea	
028	93030	-	Washer Lock Serrated External 10-32 SS		1	ea	
029	A079-00000	-	Sensor, Platinum Resistance, Thin Film, -50C to +500C	PT1000 A	1	ea	
030	W001-00108	-	Wire, PTFE, Type A, 300V, 6A, 200C	7/0.2 Grey		(AR)	
031	W001-00109	-	Wire, PTFE, Type A, 300V, 6A, 200C	7/0.2 White		(AR)	
032	W001-00110	-	Wire, PTFE, Type A, 300V, 6A, 200C	7/0.2 Pink		(AR)	
033	W001-00100	-	Wire, PTFE, Type A, 300V, 6A, 200C	7/0.2 Black		(AR)	
034	W001-00102	-	Wire, PTFE, Type A, 300V, 6A, 200C	7/0.2 Red		(AR)	
035	W001-00103	-	Wire, PTFE, Type A, 300V, 6A, 200C	7/0.2 Orange		(AR)	
036	W001-00104	-	Wire, PTFE, Type A, 300V 6A, 200C	7/0.2 Yellow		(AR)	

PARTS LISTING

Part:	Issue:		Drawn:	Checked:	Approved:
			GPW	PS	SE
80893	B		Date: 04/04/2004	Date: 03/02/2005	Date: 08/02/2005

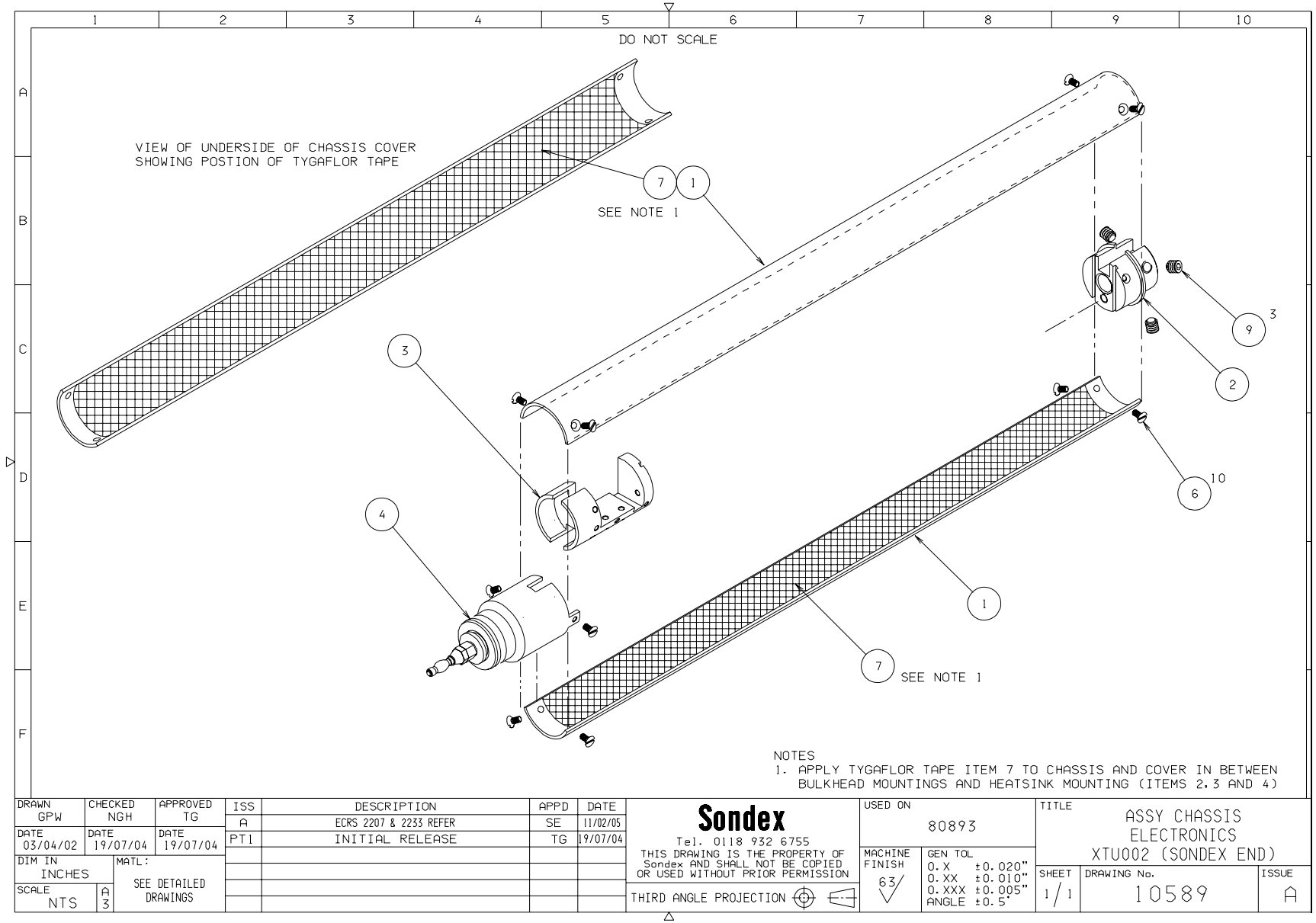
Description:

Assy. XTU002 Electronic Cartridge

PARTS LIST

Item	*Part No.*	*Issue*	*Description*	*Component Value*	*Qty*	*Units*	*Remarks*
037	W001-00106	-	Wire, PTFE, Type A, 300V, 6A, 200C	7/0.2 Blue		(AR)	
038	W010-029sw	-	Tinned Copper Wire	TCW 29SWG		(AR)	
039	W001-00107	-	Wire, PTFE, Type A, 300V, 6A, 200C	7/0.2 Violet		(AR)	
040	A006-0099C	-	Solder Wire, Alloy Sn99.3/Cu0.7, High Activity Rosin 309	Sldr Wire 99C Rosin		(AR)	
041	A044-006M4	-	Kynar Heat Shrink Sleeving 6.4mm			(AR)	
042	A044-003M2	-	Kynar Heat Shrink Sleeving 3 2mm			(AR)	
043	91552	-	Wavy Washer, 3 Waves, Overlapped, 0100, St/Steel		1	ea	
044	A078-S35SL	-	Heat Transfer Compound, Silicone	EHTS35SL		(AR)	
800	AD-80893	C	ASSY DRG OF 80893			(AR)	

(AR = As Required)



PARTS LISTING

Part:	Issue:		Drawn:	Checked:	Approved:
			GPW	NGH	TG
10589	B		Date: 03/04/2002	Date: 19/07/2004	Date: 19/07/2004

Description:
Assy Chassis Electronics (Mech parts) XTU002 (Sondex end)

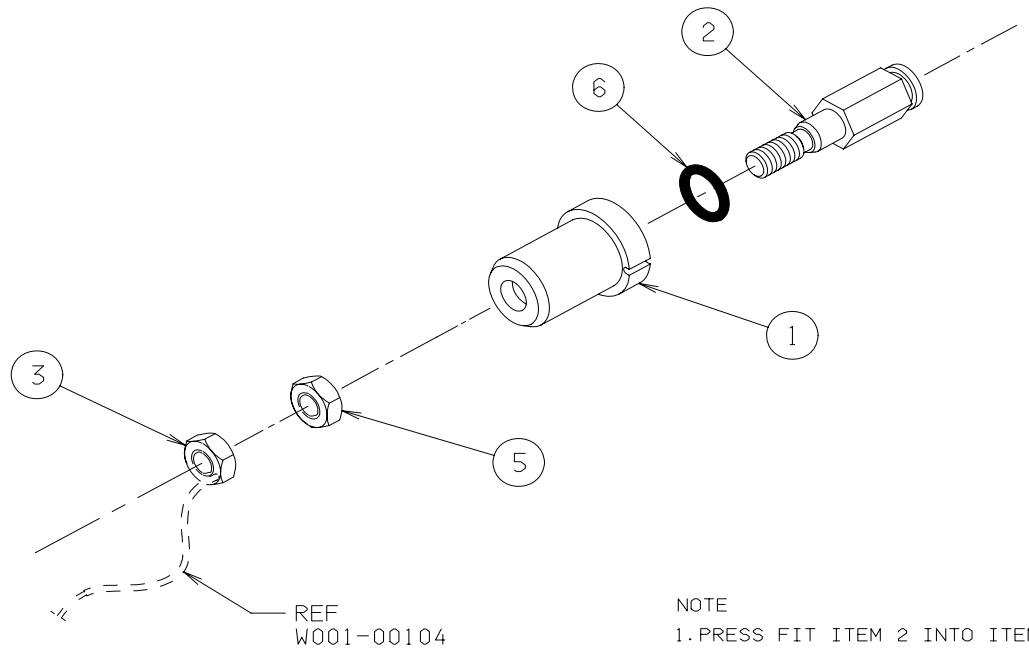
CHANGE HISTORY					RELATED DOCUMENTS		
Iss	*Date*	*Remarks*	*Chkd*	*Appr*	*# Documents*	*Issue*	*Notes*
A	08/02/2005	ECRS 2207 & 2233 REFER	PS	SE			
B	10/07/2007	ECR 4588 Applied	ICJ	NPB			

PARTS LIST

Item	*Part No.*	*Issue*	*Description*	*Component Value*	*Qty*	*Units*	*Remarks*
001	16511	PT3	Half-Shells Electronics XTU		1	pr	
002	01006	G	Bulkhead, Electronics, Lower, Standard (Non-Lemo)		1	ea	
003	16512	A	Bulkhead Heatsink		1	ea	
004	16501	A	Assy, Upper Electronics Bulkhead, SX (Isolation)		1	ea	
005						(AR)	
006	01029	-	Screw Csk Hd(Slotted) M3 x 06mm LG SS		10	ea	
007	T004-008AP	-	Tape Tygaflor 208AP/03T 80mm x 30M	Tygaflor Tape		(AR)	
008						(AR)	
009	01030	-	Screw, Grub Skt Hd, M6 x 6mm Long, St/Steel		3	ea	
800	AD-10589	A	Assembly Drawing			(AR)	
801	AI-10589	PT1	Assembly Instruction			(AR)	
802	AR-10589	PT1	Assembly Record			(AR)	

(AR = As Required)

DO NOT SCALE



NOTE

1. PRESS FIT ITEM 2 INTO ITEM 1.
2. HAND TIGHTEN ONLY NUT ITEM 5, LOCK SECOND NUT ITEM 3 TO ITEM 5 USING TWO SPANNERS BEING CAREFUL NOT TO OVERTIGHTEN AND DEFORM ITEM 1.

DRAWN	CHECKED	APPROVED
JDR	AJG	DJF
DATE 07-10-98	DATE 04-01-99	DATE 21-01-99

DIM IN INCHES | MATL: SEE DETAIL DRAWINGS | SCALE 1:1 | A4

ISS	DESCRIPTION	APPD	DATE
D	REF ECR 2653	GC	22/06/05
C	REF ECR 2382 ITEM 4 REMOVED	NPB	14/01/05
B	REFER TO ECR 1524	DJF	06/06/03
A	INITIAL RELEASE		

Sondex
Tel. 0118 932 6755

THIRD ANGLE PROJECTION

MACHINE FINISH 63 | USED ON COM

GEN TOL
0.X ±0.020"
0.XX ±0.010"
0.XXX ±0.005"
ANGLE ±0.5°

TITLE: ASSY CONNECTOR LOWER SONDEX SEALING TYPE

SHEET 1/1 | DRAWING No. 10057 | ISSUE D

SONDEX FM No: F0024

PARTS LISTING

Part:	Issue:		Drawn:	Checked:	Approved:
10057	D		JDR	AJG	DJF
			Date: 07/10/1998	Date: 04/01/1999	Date: 21/01/1999

Description:

Assy Connector Lower SX Sealing Type

CHANGE HISTORY

Iss	*Date*	*Remarks*	*Chkd*	*Appr*
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
D	06/01/2005	Re: ECR 2382	NPB	NPB

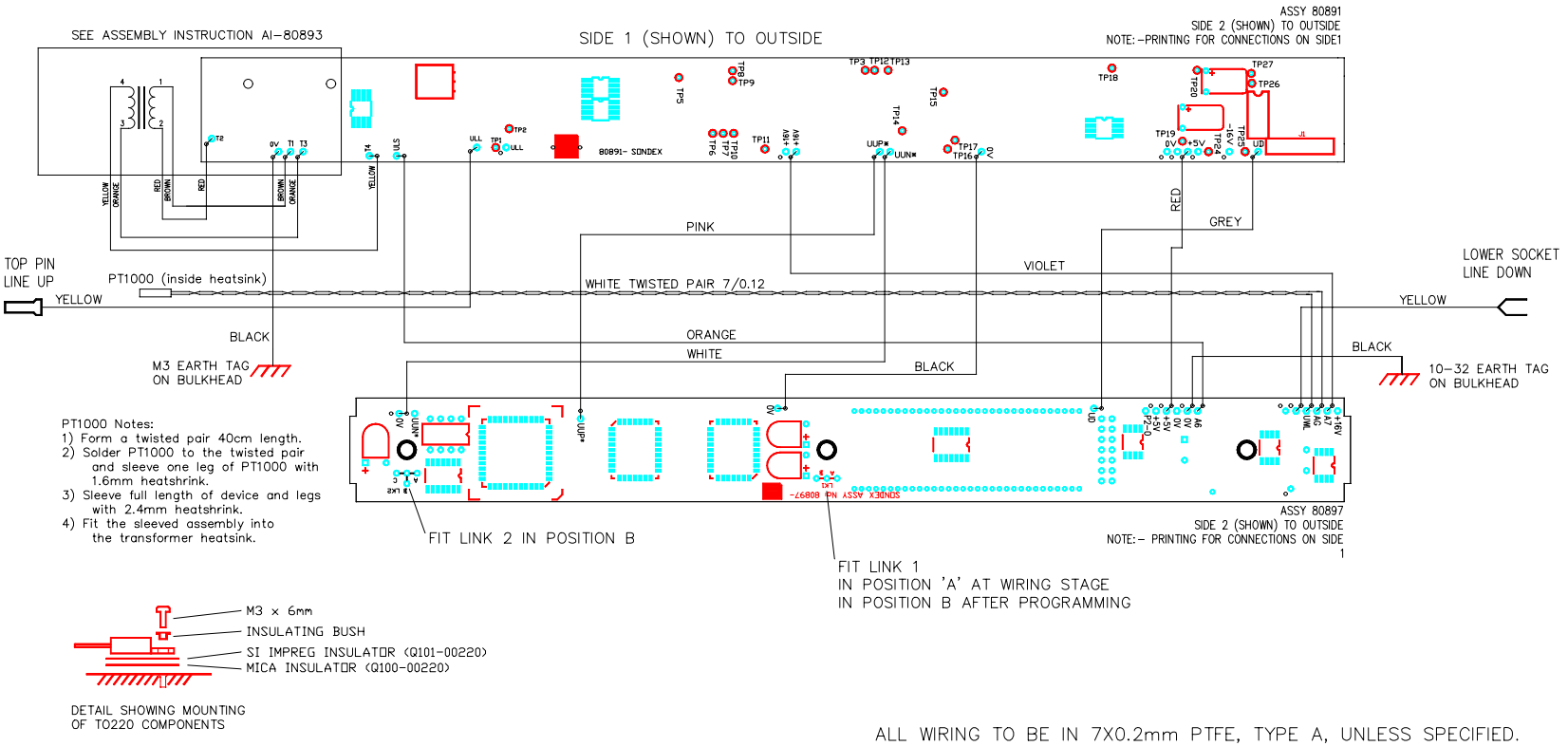
RELATED DOCUMENTS

#	*Documents*	*Issue*	*Notes*
01	AD10057	D	ASSEMBLY DRG

PARTS LIST

Item	*Part No.*	*Issue*	*Description*	*Component Value*	*Qty*	*Units*	*Remarks*
001	00690	E	Insulator Lower Sub		1	ea	
002	00695	C	Pin Hex Female Lower		1	ea	
003	10016	B	Nut, Hex, 10-32UNF, Brass/Nickel Plate, (with wire hole)		1	ea	
005	93133	-	Nut Hex 10-32 BNP		1	ea	
006	95009	-	O-ring 009 Viton 75		1	ea	

(AR = As Required)



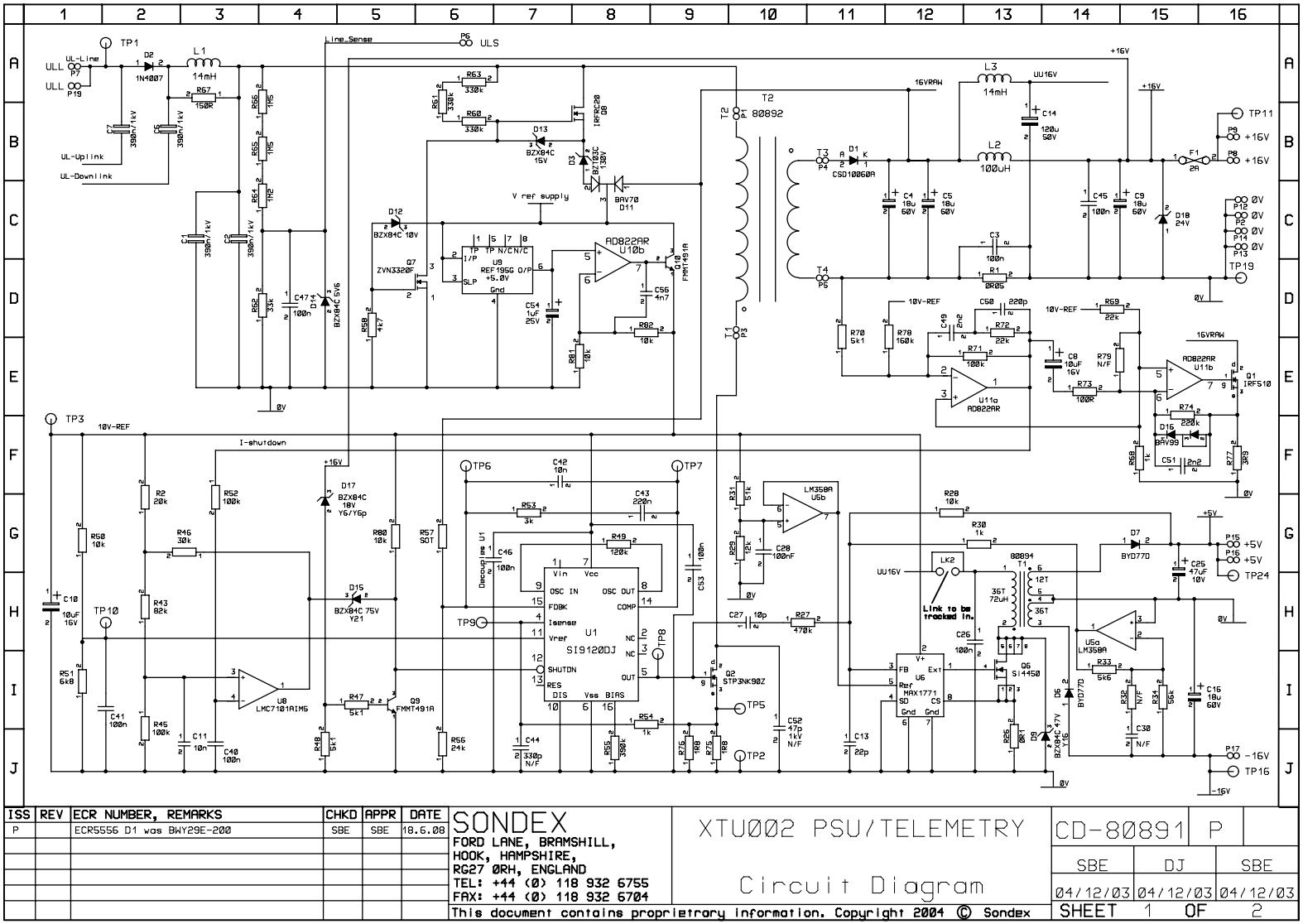
ISS	REV	DATE	CHANGES	CHKD	APPD
A		29/11/04	Initial release		
A	01	13/06/05	ECR2774 correct Assy numbers	PS	PS
B		28/04/06	ECR3778 Refers	NPB	NPB
C		12/02/07	ECR4468 80891 PCB was Iss F	BET	(SE)

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

TITLE:
WIRING DIAGRAM
XTU002

DRAWN	CHECKED	APPROVED
P. Smith	S. Ellenby	S. Ellenby
DATE 07/03/06	DATE 07/03/06	DATE 07/03/06

DRAWING No. WD 80893
ISSUE C
REVISION



ISS	REV	ECR NUMBER, REMARKS	CHKD	APPR	DATE
P		ECR5556 D1 was BWY29E-200	SBE	SBE	18.6.08

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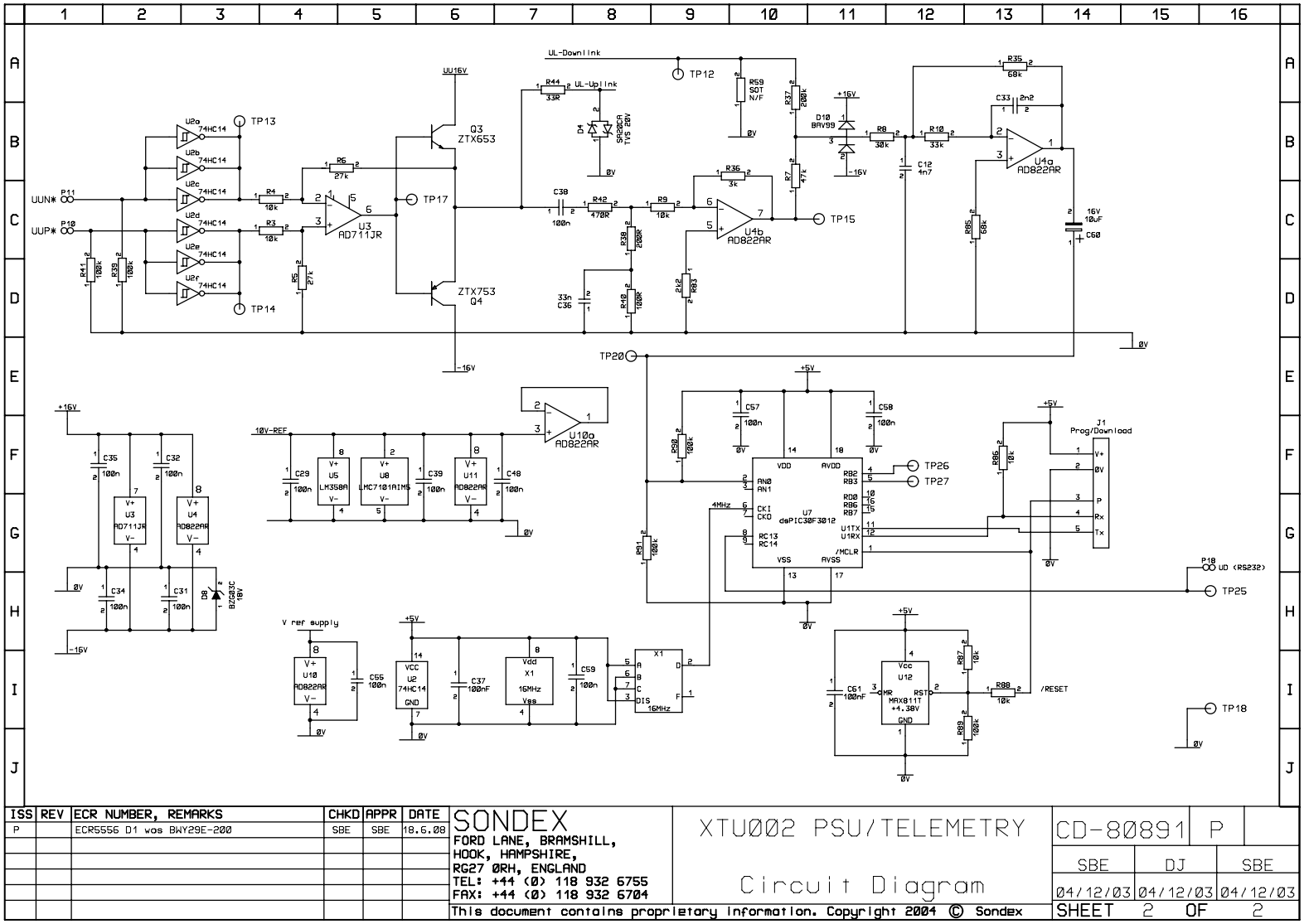
XTU002 PSU/TELEMETRY

Circuit Diagram

CD-80891 P

SBE	DJ	SBE
04/12/03	04/12/03	04/12/03

SHEET 1 OF 2



ISS	REV	ECR NUMBER, REMARKS	CHKD	APPR	DATE
P		ECR5556 D1 was BWY29E-200	SBE	SBE	18.6.08

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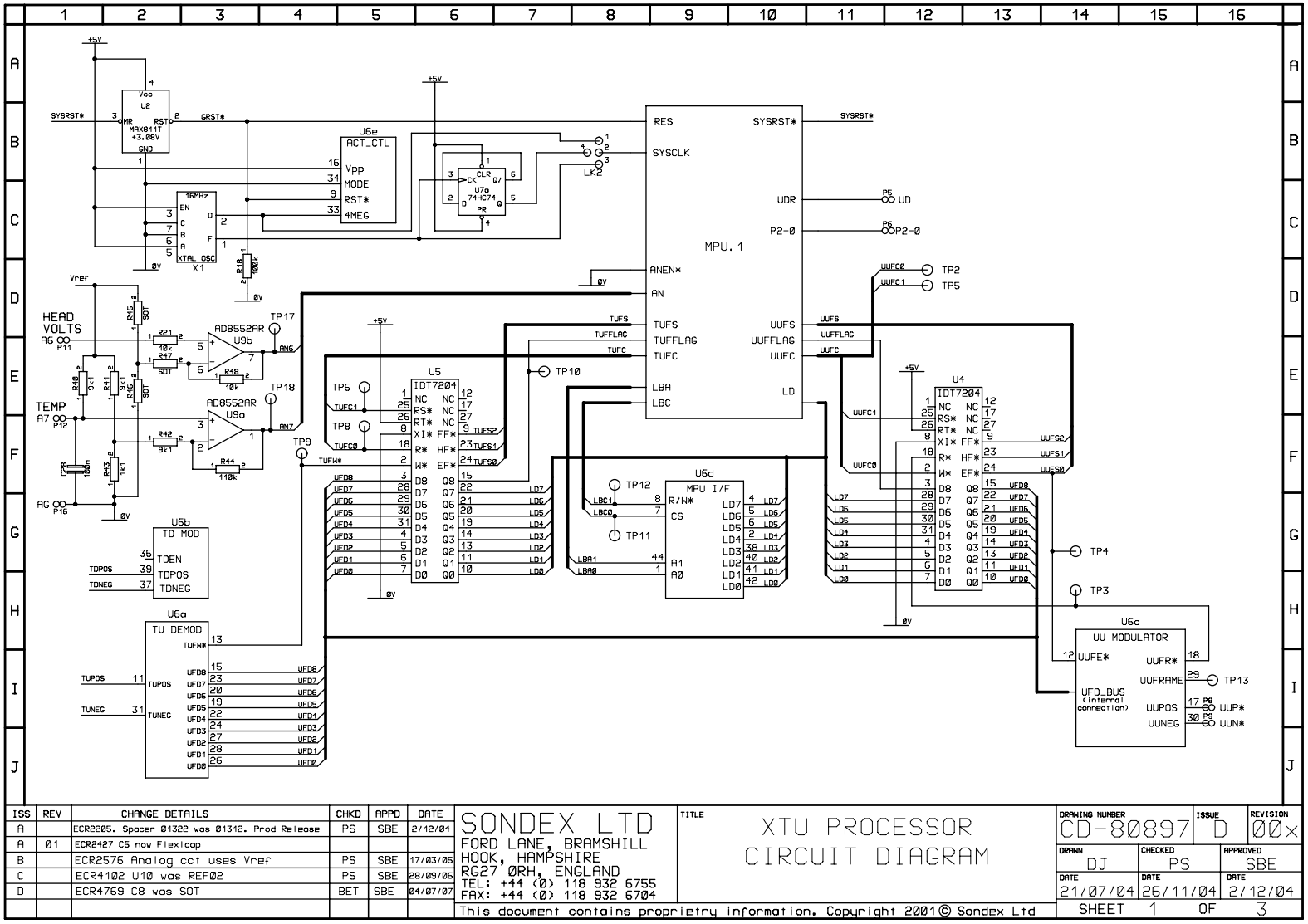
XTU002 PSU/TELEMETRY

Circuit Diagram

CD-80891	P	
SBE	DJ	SBE
04/12/03	04/12/03	04/12/03

SHEET 2 OF 2



ISS	REV	CHANGE DETAILS	CHKD	APPD	DATE
A		ECR2205. Spacer Ø1322 was Ø1312. Prod Release	PS	SBE	2/12/04
A	Ø1	ECR2427 C6 now Flexicap			
B		ECR2576 Analog cct uses Vref	PS	SBE	17/03/05
C		ECR4102 U10 was REF02	PS	SBE	28/09/06
D		ECR4769 C8 was SOT	BET	SBE	04/07/07

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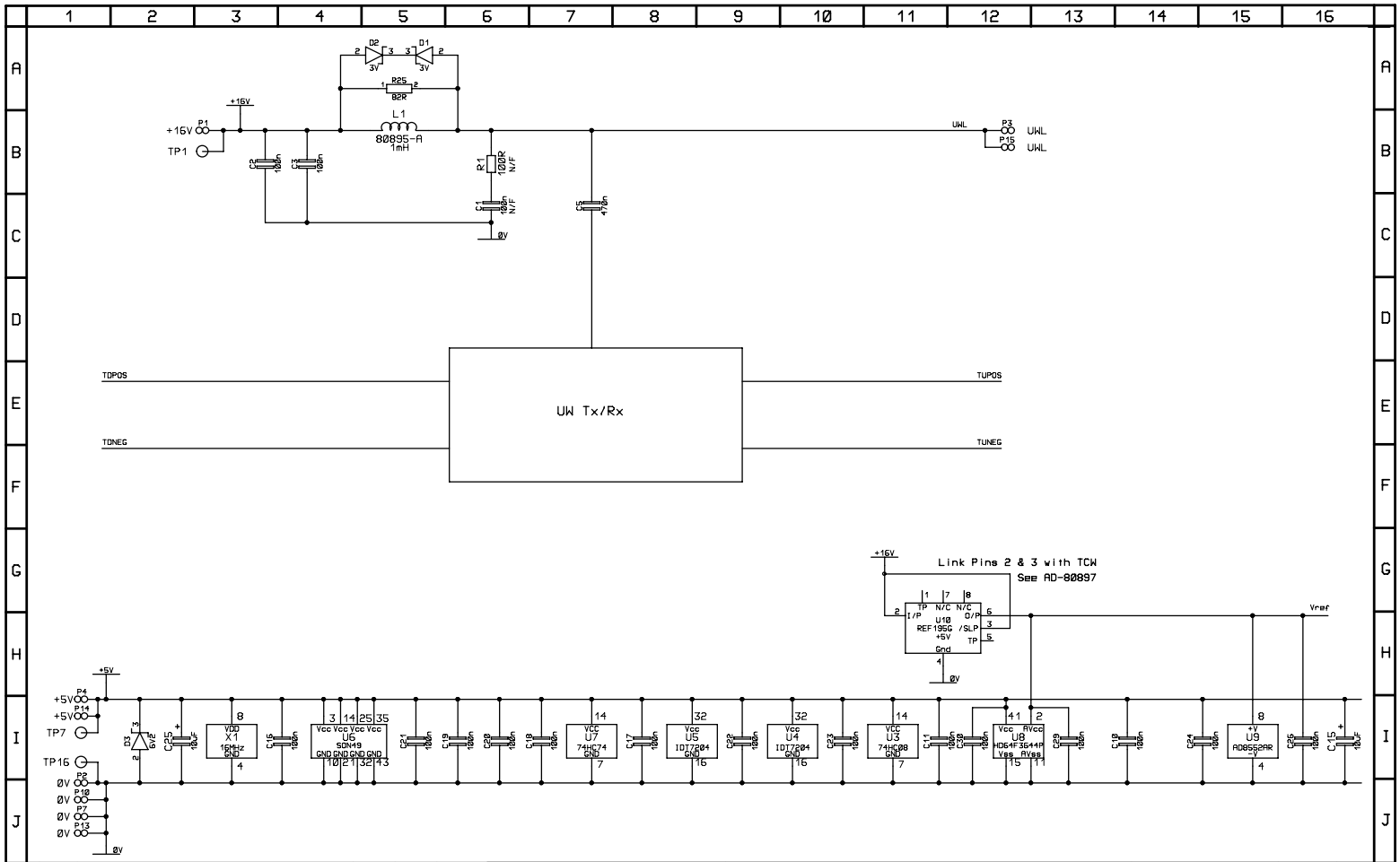
TITLE: XTU PROCESSOR CIRCUIT DIAGRAM

DRAWING NUMBER	ISSUE	REVISION
CD-8Ø897	D	ØØx

DRAWN	CHECKED	APPROVED
DJ	PS	SBE
DATE 21/Ø7/Ø4	DATE 26/11/Ø4	DATE 2/12/Ø4

SHEET 1 OF 3



ISS	REV	CHANGE DETAILS	CHKD	APPD	DATE
A		ECR2205. Spacer 01322 was 01312. Prod Release	PS	SBE	2/12/04
A	01	ECR2427 C6 now Flexicap			
B		ECR2576 Analog cct uses Vref	PS	SBE	17/03/05
C		ECR4102 U10 was REF02	PS	SBE	28/09/06
D		ECR4769 C8 was SOT	BET	SBE	04/07/07

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HOOK, HAMPSHIRE
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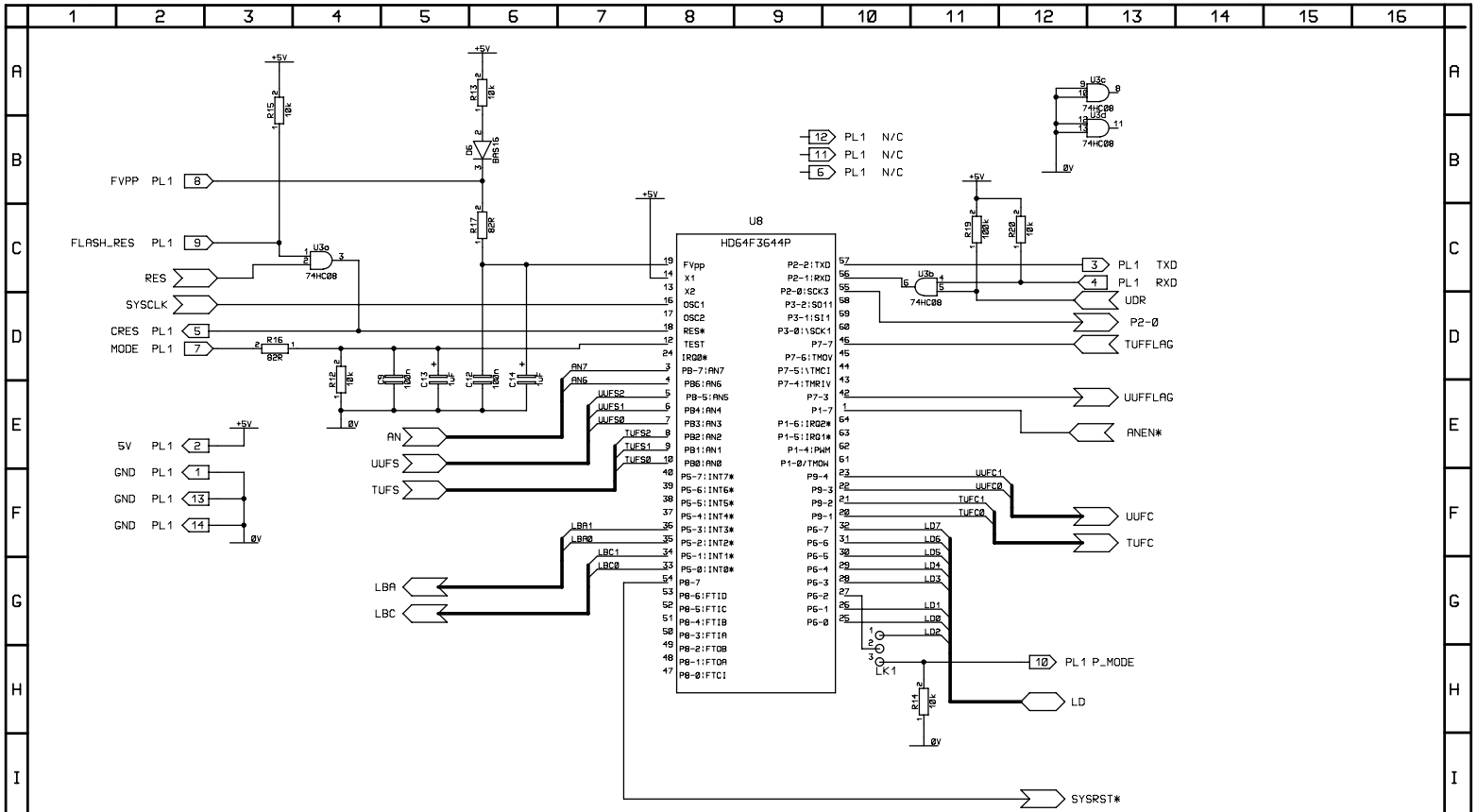
TITLE
XTU PROCESSOR
CIRCUIT DIAGRAM

DRAWING NUMBER	ISSUE	REVISION
CD-80897	D	00x

DRAWN	CHECKED	APPROVED
DJ	PS	SBE
DATE 21/07/04	DATE 26/11/04	DATE 2/12/04

SHEET 2 OF 3



ISS	REV	CHANGE DETAILS	CHKD	APPD	DATE
A		ECR2205. Spacer 01322 was 01312. Prod Release	PS	SBE	2/12/04
A	01	ECR2427 C6 now Flexicap			
B		ECR2576 Analog cct uses Vref	PS	SBE	17/03/05
C		ECR4102 U10 was REF02	PS	SBE	28/09/06
D		ECR4769 C8 was SOT	BET	SBE	04/07/07

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TITLE: XTU PROCESSOR CIRCUIT DIAGRAM

DRAWING NUMBER	ISSUE	REVISION
CD-80897	D	00x

DRAWN	CHECKED	APPROVED
DJ	PS	SBE
DATE 21/07/04	DATE 26/11/04	DATE 2/12/04

SHEET 3 OF 3