Nasim Hamrah Industries co.

Production Logging Tools

(PLT)

ULP

Ultralink Logging Panel

DESCRIPTION

The Ultralink Logging Panel (ULP) has 2 primary functions:

- To supply power to the tool string down hole.
- To act as the surface half of a telemetry system between the down hole tool string and The PC.

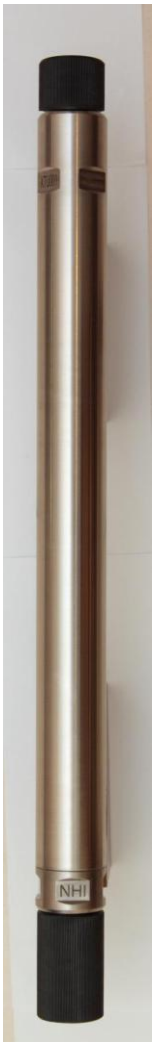
It contains a power supply, user controls and displays, an interface to communicate with a PC and an Ultralink communications modem to provide telemetry up and down the wire line.

SPECIFICATION ULP

Parameter	Specification	Remarks
Box type	2U 19″	
Height	90mm	
Depth	445m	
Width	480mm	
Weight	9kg	
Max Temperature	55°C	
Operating Voltages	110/230 VAC dual range	
Typical Current Consumption	2A@230VAC and 4A@115VAC	Powering XTU and SCT
Data Rate	50, 71,100, 142, 200 k bit/sec	Selectable

XTU

Ultralink/Ultrawire Downhole Controller



DESCRIPTION

The XTU Down hole Controller is an intelligent bridge between the Ultrawire tool bus and the NHI Ultralink telemetry system. It serves both as a communications interface and as a programmable logging controller. It also incorporates a dc-dc converter (switch mode power supply) to convert the high voltage on the Ultra link line to power the Ultrawire tool bus.

In its capacity as a logging controller, the XTU polls each tool on the tool string 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 determined by a logging program, which may be generated automatically 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.

PURPOSE

The purpose of the XTU Down hole Controller is:

- To collect data from tools on the Ultra wire tool bus and to transmit this data to the Surface via the Ultralink line automatically or under user control.
- 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 tool bus.

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 (50-200 kBits/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 tool bus error detection and logging to facilitate fault finding.

SPECIFICATION XTU

Parameter	Specification	Remarks
Temperature(MAX)	177ºC	
Pressure(MAX)	20000 psi	
Diameter	42mm	
length	578 mm	Excluding thread protectors
Weight	3.2kg	
Operating voltage Nominal Range Absolute max	 +200VDC +120-300VDC +300VDC	
Current consumption at 200v	20mA (No load), 28-30mA (running SCT)	
Ultrawire toolbus current at Ambient (MAX)	800mA	
Ultrawire toolbus current at 177ºC (MAX)	400mA	
End thread (top/bottom)	1 3/16 UNF	Female/male
End connector(top/bottom)	4mm banana single conductor	Pin/socket
Tools on bus	62	Subject to power requirements
Ultrawire toolbus data rate	500kbits/s	

CCL

Casing Collar Locator

DESCRIPTION

The NHI CCL015 (Ultrawire Casing Collar Locator) responds to changes in metal volume such as at tubing collars and perforations.

CCL015 operates as part of a Ultrawire toolstring and derives power and control from a suitable system controller e.g. XTU.

As the tool passes a collar or a change in metal volume, lines of metal flux between two opposing permanent magnets are disturbed.

This induces a low frequency voltage or EMF in a coil mounted between the magnets. This signal is amplified and compensated for line speed to maintain a high signal gain in all circumstances.

Finally the signal is converted by a voltage-controlled oscillator for recording in the Ultrawire section of the tool.

The line conductor passes through the tool from upper to lower heads.

PURPOSE

Location of casing collars is used for depth control.

APPLICATIONS

- Depth control in casing or tubing.
- Location of casing or tubing damage.
- Confirmation of perforation depths or intervals.

SPECIFICATION CCL

Parameter	Specification	Remarks
Temperature (max)	177°C	
Pressure (max)	20000 psi	
Diameter	42mm	
Length	567mm	Toolstring makeup length
Depth offset	6.5″	Above lower tool joint.
Operating Voltage:		
Nominal	+18 V DC	Response parameters specified
Specified	+13 to +23V	Parameters not specified
Absolute Max	+24 V	
Current consumption at +18V	16 mA	Typical
Acquisition time	1ms	External limitation
End threads (top/bottom)	1 3/16″ 12 UN2A GO	
End connectors (top/bottom)	4mm single conductor	

CFB

Spinner Flow meter

DESCRIPTION

Halliburton's Caged Fullbore Flow meter (6-arm CFBM) is a larger variation of the 6-arm CFBM. Like its smaller counterpart, the 6-arm CFBM accurately measures downhole flow rates with coverage over a large cross section of the casing. Run at the bottom of the production-logging tool string, the 6-arm CFBM centers the spinner and supports the tool weight in deviated wells.

Using a large-diameter impeller, it has the ability to detect very low flow rates, making it a valuable tool for operators and Logging engineers.

In addition, it has some extra upgrade options Unavailable on the smaller model.

The tool has a 6-arm, spring-loaded cage that centers the spinner in the middle of the flow and supports tool weight in deviated Wells.

A large diameter impeller measures flow rates with coverage over a large cross section of the casing. The spinner runs on precision bearings, and its rotation is sensed by zero-drag Hall-effect detectors, the signal from which is converted into a flow-rate measurement.

The low mechanical threshold of the tool enables it to be used in low flow rates, and normal output is 10pulses per revolution with directional indication.

Benefits

- Provides accurate velocity measurements in highly deviated and horizontal wells.
- Provides velocity measurement in low flow-rate wells.
- Helps detect leaks and cross flows.
- Fullbore velocity profiling for both injection and production wells.

Features

- Interchangeable mechanical sections to match casing sizes from2.1-4 to 8.5-9in. (114to245mm).
- Fully combinable with all Ultrawire™ production-logging tools.
- Surface readout and memory-logging operations.
- Lockable spinner for high-rate injection wells (standard feature for 8.5-9in. tools).
- Solid impeller shafts for very high-rate wells.

SPECIFICATION CFB

Parameter	Specification	Remarks
Temperature (max)	177°c	
Pressure (max)	20000 psi	
Diameter	42mm	
Length	864mm	Toolstring makeup length
Sync pulse Period	1ms	
Sync pulse Width	25µs	
Telemetry Delay	640±2µs	
Operating voltage:		
Nominal	+18V DC	Response parameters spec'd
Specified	+13 to +23V	Parameters not specified
Absolute Max	+24 V	
Current consumption at +18V	20 mA	Typical
Acquisition time	1ms	
Data pulse Height	-2.7 to 3.3V	
Data pulse Width	12 and 18 ±0.5µs	
Typical frequency	10Hz/resolution	

CFJ

Continuous Jeweled Flow meter

DESCRIPTION

The CFJ flow meters comprise both Spinner Electronics & Mechanical Parts. The mechanical parts are:

- Body including upper body and bottom nose.
- Sensor Assembly and 8 pin internal connector.
- Shaft assembly comprising Shaft & Magnet.
- Spinner Blade Assembly.

CFJ spinners are fully protected within the shroud of the spinner body. The bottom nose at the bottom of the shroud prevents the spinner being damaged should the tool stand up on anything flat but may not prevent damage if a spiked object projects up inside the shroud.

5 Hall effect switches detect the magnet's rotation and are located in the sensor.

Since the overall CFJ design is for the tool to be as simple as possible, and to allow fluid flow almost full access into the spinner from below, a lower tool joint has not been allowed for. It is therefore not possible to mount anything below.

Features

- Flow profiling in complex well completions and flow regimes.
- Optimized for high fluid velocities.
- Rugged spinner housing protects against debris.
- Injection monitoring.

SPECIFICATION CFJ

Parameter	Specification	Remarks
Temperature (max)	177°C	
Pressure (max)	20000 psi	
Diameter	42mm	
Length	470.5mm	Toolstring makeup length
Sync pulse Period	1ms	
Sync pulse Width	25µs	
Telemetry Delay	640±2µs	
Operating voltage:		
Nominal	+18V DC	Response parameters spec'd
Specified	+13 to +23V	
Absolute Max	+24 V	Parameters not specified
Current consumption at +18V	21 mA	Typical
Acquisition time	1ms	
Data pulse Height	-2.7 to 3.3V	
Data pulse Width	12 and 18 ±0.5µs	
Typical frequency	10Hz/resolution	

CWH

Capacitance Water Holdup Tool

DESCRIPTION

The NHI CWH (Capacitance Water Holdup Tool) measures the water volume fraction in fluid mixtures flowing in the borehole.

It operates as part of a ultra wire toolstring and derives power and control from a suitable system controller e.g. MPL.

Part of the fluid flow passes through the tool between the electrodes of a cylindrical capacitor.

The capacitance measured depends on the dielectric constant and the distribution of the fluids between the electrodes. In well mixed fluids the tool has a linear response from zero to about 40% water volume fraction.

PURPOSE

To provide a continuous borehole log of water volume fraction. This aids identification of fluid and points of inflow.

APPLICATIONS

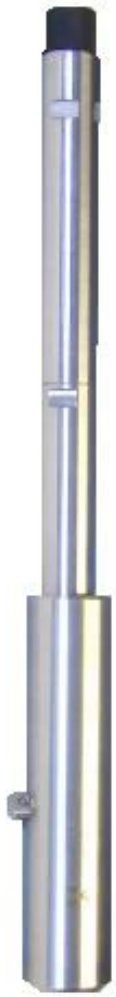
- Multi-phase Production Profiling.
- Oil/Gas/Water Holdup Calculations.
- Qualitative Analysis of high GOR, Water Free Wells.

SPECIFICATION CWH

Parameter	Specification	Remarks
Temperature (max)	177°C	
Pressure (max)	20000 psi	
Diameter	42mm	
Length	762mm	Toolstring makeup length
Depth offset	6.5″	Above lower tool joint.
Operating voltage:		
Nominal	+18V DC	Response parameters spec'd
Specified	+13 to +23V	Parameters not specified
Absolute Max	+24 V	
Current at +18V	16-17 mA	External limitation
Resolution	0.1% External limit	
Accuracy	±1.0%	
Range	0-100%	
Acquisition time	1Sec	
End threads	4mm single conductor	
End connectors	1 3/16″ UNF	

FDR

Fluid Density Radioactive Tool



DESCRIPTION

The NHI FDR (Fluid Density Radioactive Tool) measures borehole fluid density by a radioactive technique. Part of the fluid flow passes through the tool between a low activity Americium 241 gamma source and a scintillation gamma-ray detector. An increase in the average fluid density in the sample volume causes a reduction in received counts.

The detector is shielded to reduce interference from the radioactive scale.

The electronics interface to the NHI Ultra wire tool bus for use in memory or surface readout PL tool strings. The single conductor passes through the tool carrying telemetry and power.

PURPOSE

The purpose of the FDR is to measure fluid density of a sample as it flows through the tool. The average density of this volume is measured whether the flow is single or multiphase.

This measurement can be used to determine the proportions of two phases of different but known densities in a two phase fluid mixture.

For example, water fraction may be calculated. If, in addition, the total fluid mixture flowrate and the slippage of one phase relative to the other are known then calculations can be made to determine the flowrate of each of the two fluids along the axis of the well.

Note that fluid density outside the sample volume is not

measured.

The measure cavity is asymmetrical to prevent preferential hold up ofa single phase.

APPLICATIONS

- Multiphase production profiling.
- Fluid Identification.
- Horizontal/highly deviated wells.
- High fluid flow rates.

SPECIFICATION FDR

Parameter	Specification	Remarks
Temperature (max)	177°C	
Pressure (max)	20000 psi	
Diameter	42mm	
Length	682 mm	Toolstring makeup length
Measure point	110mm	Above lower tool joint.
Weight in air	4.15 kg	
Operating voltage:		
Nominal	+18V DC	Response parameters spec'd
Specified	+13 to +23V	Parameters not specified
Absolute Max	+24 V	
Current consumption at +18V	35 mA	External limitation
Density:		
Range	0 to 1.25g/cc	
Resolution	0.01g/cc	
Accuracy	0.03g/cc	Based on 2% statistics and 2% drift
Acquisition time	1 sec	Typical
Radioactive source:		
Material	Americium 241	
BSI/ISO classification	C66544	

Detector:	
Type	NaI scintillation crystal
Sensitivity threshold	20keV approx
End threads (top/bottom)	1 3/16″ UNF
End connectors (top/bottom)	4 mm single conductor
Shield:	
Weight	5.4kg
Length	10.5″
Outside Diameter	2.8″

ILS

In Line Spinner Flow meter

DESCRIPTION

NHI's In-Line Spinner Flow meter (ILS) is a compact Flow- meter that can be run in combination with other production-logging tools.

With its compact design, the ILS is an easy way to measure fluid velocity in well environments too small for full-bore spinners. It is also an ideal backup for other spinners that might be damaged due to the wellbore environment.

The ILS spinner can rotate with very little friction, which makes it an ideal candidate for low-flow wellbores. Additionally, as part of the Ultra wire™ family of products, the ILS works in tandem with any other Ultrawire tool the operator chooses to employ.

The ILS allows for production profiling in tubing and casing within one logging run, and is less susceptible to the effects of jetting (high-velocity fluid entry from perforations) than a full-bore spinner.

The ILS has a shroud that protects the spinner blade as the tool moves through well restrictions. A combination of the ILS and the Caged Full-Bore Spinner tools provides a continuous optimized flow profile.

Precision roller bearings allow the spinner to rotate with minimal friction. As fluid moves past the spinner, rotation is detected by zero-drag Hall-effect sensors.

The spinner blade is optimized to have a very low mechanical threshold, and thus is ideal for low flow-rate wells. The signal from the Hall-effect sensors is converted into a spinner-rate measurement with direction indication

(up or down flow).

Benefits

- Enables fluid velocity measurements in both flowing and injection wells.
- Provides an additional velocity measurement in case the other spinners are damaged.
- Velocity measurement independent of casing and tubing size.

Features

- Fully combinable with all Ultrawire production-logging tools.
- High-temperature polymer spinner blade.
- Surface readout or memory-logging operations.

SPECIFICATION ILS

Parameter	Specification	Remarks
Temperature (max)	177°C	
Pressure (max)	20000 psi	
Diameter	42mm	
Length	368.3mm	Toolstring makeup length
Sync pulse Period	1ms	
Sync pulse Width	25µs	
Telemetry Delay	640±2µs	
Operating voltage:		
Nominal	+18V DC	Response parameters spec'd
Specified	+13 to +23V	Parameters not specified
Absolute Max	+24 V	
Current consumption at +18V	20 mA	Typical
Acquisition time	1ms	
Data pulse Height	-2.7 to 3.3V	
Data pulse Width	12 and 18 ±0.5µs	
Typical frequency	10Hz/resolution	

PDC

Production Dual (X-Y) Caliper

DESCRIPTION

The NHI Dual X - Y Caliper is run centralized in the Production Logging toolstring. The Caliper arm mechanisms set at 90° to each other to measure casing inside diameter in the X - Y axes. The Caliper assembly is fully collapsible down to tool diameter for running into and pulling out of hole.

OPERATING PRINCIPLE

The caliper is spring loaded and follows tubing ID while running in hole. It opens fully on leaving the tubing to enter the casing. Each arm operates as an independent unit exerting a constant radial force in any casing diameter.

LVDT sensors protected within the main shaft measure by induction the position of the coupled collars external to the shaft. The position of the collar blocks are related to the tubing ID.

APPLICATIONS

- Determination of X and Y diameters at 90°.
- Measuring of casing deformation and major corrosion.
- Detection of scale build-up in casing or tubing.
- Correction of spinner derived fluid velocity for varying
- Casing or open hole completion diameter.
- Identifying ID to correlate with changes in holdup patterns.

SPECIFICATION PDC

Parameter	Specification	Remarks
Temperature (max)	177°C	
Pressure (max)	20000 psi	
Diameter	42mm	
Length	1049mm	Toolstring makeup length
Depth offset:	1ms	
Lower Arms (Y)	0.17-0.21m	
Top Arm (X)	0.25-0.29m	
Weight in air	6.5 kg	
Operating voltage:		
Specified	+18V DC	Response parameters spec'd
Functional	+13 to +23V DC	
Absolute Max	+24 V	Parameters not specified
Current consumption at +18V	24 mA	Typical
Resolution	0.015″	
Accuracy	0.1″	
	0.2″	
	0.3″	
Measure Range	2″ - 9″ diameter	
Acquisitiom	1 sec	
End	1 3/16″ UNF Gearhart	

threads(top/botom)	(female/male)

PGR

Production Gamma Ray Tool

DESCRIPTION

The NHI PGR (Production Gamma Ray Tool) comprises a Sodium Iodide scintillation crystal and photomultiplier to measure incident gamma radiation.

The electronics interfaces to the NHI MPL memory type Ultrwire telemetry.

The single conductor passing through the tool carries telemetry and power.

The detector is unshielded and will thus accept radiation from any direction.

PURPOSE

Passive gamma detection provides:

- Litho logy Identification.
- Depth Correlation.
- Identification of Radioactive Scale, possible sign of water entry.
- Monitoring of Radioactive flow tracer.
- Gravel Pack density monitoring (with addition of gamma source).

SPECIFICATION PGR

Parameter	Specification	Remarks
Temperature (max)	177°C	
Pressure (max)	20000 psi	
Diameter	42mm	
Length	683 mm	Toolstring makeup length
Depth offset	4.5″	
Weight	3.39kg	
Operating voltage:		
Nominal	+18V DC	Response parameters spec'd
Specified	+13 to +23V	Parameters not specified
Absolute Max	+24 V	
Current consumption at +18V	20 mA	Typical
Maximum count rate (API)	2000 cps	Reads higher subject to dead time
Dead time	Negligible	Below 1000 API
Sensitivity threshold	20 keV approx.	
Nominal calibration	1 count/API	
Depth resolution	6″ typical	
End threads	1 3/16″ UNF	
End connectors	4m banana single conductor	

PRT

Platinum Resistance Temperature Tools

DESCRIPTION

The NHI Platinum Resistance Temperature Tools measure the borehole fluid temperature. The PRT016 operates as part of a Ultra wire tool string and can operate as both wireline and memory depending on the system controller, such as an XTU.

The power is also supplied by the system controller.

The sensor of the tool is a platinum resistance wire housed in an Inconel needle. The device is fast reacting, accurate, stable and repeatable.

The line conductor passes through the tool from upper to lower heads.

PURPOSE

To provide a continuous borehole fluid temperature log. This can aid Identification of fluid origin and points of inflow.

APPLICATIONS

- Production and Injection Log interpretation.
- Location of Fluid Movement behind pipe or casing.
- Location of fluid entry, gas leaks and injection zones.
- Cement top determination.

SPECIFICATION PRT

Parameter	Specification	Remarks
Temperature (max)	177°C	
Pressure (max)	20000 psi	
Diameter	42mm	
Length	310 mm	Toolstring makeup length
Depth offset	1 3/4″	
Weight	2.35kg	
Operating voltage:		
Nominal	+18V DC	Response parameters spec'd
Specified	+13 to +23V	Parameters not specified
Absolute Max	+24 V	
Current consumption at +18V	20 mA	Typical
Resolution:	0.0035°C	
For 1 sec acquisition time		
Acquisition time (Typical)	1 sec	
Accuracy	±0.5°C	
Linearity	0.15% of full scale	For 2 point cal.
Responds time	0.5 sec	
End threads	1 3/16″ UNF	
End connectors	4m banana single	

conductor

QPS

Quartz Pressure Single Sensor Tool

DESCRIPTION

The Quartz Pressure Single Sensor Tool (QPS) is used to provide a continuous log of borehole fluid pressure and to record reservoir pressure draw-down and build-up data during flowing tests The NHI Quartz Pressure Tool measures pressure and gauge temperature using an industry standard precision quartz crystal pressure transducer.

A Quartz dyne 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 while the tool is running in hole.

PURPOSE

- Pressure gradient measurement.
- Draw-down and build-up pressure transient Analysis.
- Combinable with other Ultrawire™ tools.
- Precision and accurate measurement.
- Fast response to small changes in fluid pressure.

SPECIFICATION QPS

Parameter	Specification	Remarks
Temperature (max)	177°C	
Pressure (max)	20000 psi	
Diameter	42mm	
Length	580 mm	Toolstring makeup length
Depth offset	2.9″	
Weight	4 kg	
Operating voltage:		
Nominal	+18V DC	Response parameters spec'd
Specified	+13 to +23V	Parameters not specified
Absolute Max	+24 V	
Current consumption at +12V	20 mA	Typical
End threads	1 3/16″ UNF	
End connectors	4m banana single conductor	
QUARTZDYNE QU-16K-B		
Pressure:		
Max total/combined error	0.02% FS	
Resolution	0.008 psi	Depends on acquisition parameters

Response time	<1 sec for 99.5%	
Ageing	< 3 psi/year	
Temperature:		
Accuracy	0.15 % typical	
Resolution	<0.005°C	Depends on acquisition parameters
Ageing	0.16°C/year	
Reference clock:		
Ageing	<2ppm/year	

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