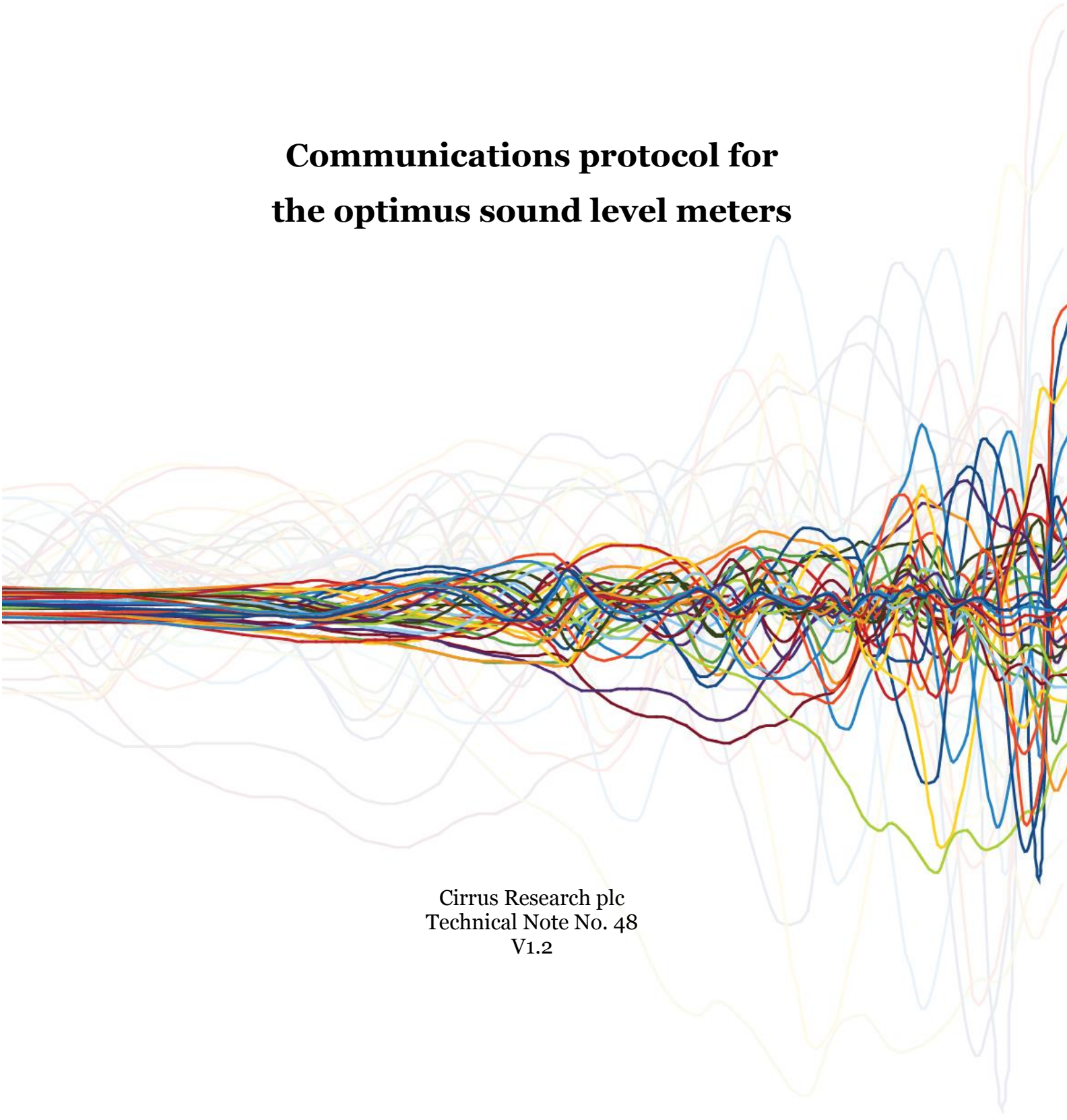
Communications protocol for the optimus sound level meters



Cirrus Research plc
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V1.2

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1 Revision History

1.1 Version 1.1

Additions

- Section 3 Command Summary
- Section 4.8 Instrument settings
- Section 13 Examples of data communications

Amendments

- Section 6 Help
- Section 11 Live Data
- Document formatting

1.2 Version 1.2

Amendments

- Section 12 Previous Measurements

2 Introduction

This document describes the RS232 serial command protocol for the Cirrus Research optimus sound level meters.

This document is subject to change without notice. The latest version of this document can be downloaded from the Cirrus Research plc website at www.cirrusresearch.co.uk/library

3 Command Summary

4 Basic Information

4.1 Connecting cable

Communication over RS232 with the optimus requires the ZL:175 Optimus RS232 to PC Cable

4.2 Data rate & parity

The baud rate is 115200 (default) or 9600 baud.
See 'Baud Rate Settings' below for details

Data Bits: 8
Parity: None
Stop Bits: 1
Flow Control: None

4.3 Command & response termination

All commands are terminated by CRLF ('\r\n').
All responses are terminated by CRLF ('\r\n').

4.4 Command case

Commands and Responses are not case sensitive but are defined here in uppercase.

4.5 Un-recognised commands

Unrecognised commands are ignored.

4.6 Command language

All commands are in English.

4.7 Command echo

Commands are not echoed back.

4.8 Instrument settings

All instrument settings for the optimus sound level meters are available via the NoiseTools software.

Measurement timers and Ln values are configured via the NoiseTools software.

Single or repeating measurement timers can be configured from 1 minute upwards via the NoiseTools software.

5 Baud Rate Settings

The Optimus has two choices of baud rate: 115200 baud (default) and 9600 baud. The baud rate is set using NoiseTools.

In the 'Advanced' section of the 'Configure' window in NoiseTools, select the 'Port A' setting as follows:

- 'Terminal' – 115200 baud
- 'SlowTerminal' – 9600 baud

6 Help

This command gives some basic information along with a list of available commands.

Command	HELP?
Response	<Basic connection information> <List available of commands, 1 per line>

Example

```
TX: HELP?
     RX: Optimus Communications Protocol:
     RX: Commands are case insensitive, terminated with CRLF.
     RX: Responses are terminated with CRLF.
     RX: IDN?
     RX: INFO?
     RX: LIVE?
     <… all commands …>
```

Notes:

- This is intended to aid development or for manual use. It serves no purpose for automated use as part of the actual communications protocol.

7 Instrument Identification

This command displays the basic identification information from the instrument.

Command	IDN?
Response	IDN <type> <serial> <version>

<type> is the type, or model number, of the instrument.
<serial> is the unique serial number of the instrument.
<version> is the current firmware version.

Example

TX: IDN?
RX: IDN CR:123A G123456 1.0.1234

Notes:

- Any spaces within the type and serial strings are converted to '_'.

8 Instrument Detailed Information

This command displays additional information available from the instrument.

Command	INFO?
Response	INFO <info list>

<info list> is a series of space-separated integers as below:

- Battery Voltage
  - mV
- Reserved
- Preamp Temperature
  - Degrees Kelvin - Subtract 273 for Celsius
- Reserved
- Reserved
- Reserved
- Reserved
- Reserved
- Reserved
- Date and Time
  - Seconds since 01/01/1970 00:00:00

This command displays the 2nd additional information available from the instrument.

Command	INFO2?
Response	INFO2 <info2 list>

<info2 list> is a series of space-separated floats as below:

- Number of Measurements.

- Measurement Memory Free
    - Percentage
- Audio Memory Free
    - Percentage
- Modem Signal Strength
    - Range 0 to 31. Low to High
    - 99 = Unknown
- Modem Connection Data Type
    - 0 = GPRS
    - 1 = EGPRS
    - 2 = WCDMA
    - 3 = UMTS
    - 4 = Unknown
- GPS Dilution of precision (hdop)
- GPS latitude
- GPS longitude

Examples

TX: INFO?
RX: INFO 5426 0 293 0 0 0 0 0 0 1370427877
TX: INFO2?
RX: INFO2 40 98.54 94.88 99 4 0.0 0.0000000 0.0000000

9 Clock

Checking the current time

Command	CLOCK?
Response	CLOCK YYYY-MM-DDTHH:MM:SS

9.1 Setting the clock

Command	CLOCK YYYY-MM-DDTHH:MM:SS
Response	CLOCK YYYY-MM-DDTHH:MM:SS or CLOCK FAILED

Example

TX: CLOCK?
RX: CLOCK 2010-01-01T15:30:00

Notes:

- All times use the ISO 8601 format, although without time zone.

10 Measuring

10.1 Check current measuring status

Command	MEASURE?
Response	MEASURE RUNNING or MEASURE STOPPED

10.2 Start a new measurement

Command	MEASURE START
Response	MEASURE RUNNING

Notes:

- MEASURE START skips the voice tag and starts recording immediately.
- If the single or repeat timers are enabled in the instrument, these will be activated by the MEASURE START command.
- Live data is available every 1 second when the instrument is measuring

10.3 Stop the measurement

Command	MEASURE STOP
Response	MEASURE STOPPED

Notes:

- MEASURE STOP will over-ride single or repeat timers.

10.4 Reset the measurement

Command	MEASURE RESET
Response	MEASURE RUNNING or MEASURE STOPPED

Measurement timers

11 Live Data

Please refer to the end of Live Data section for details of <list>, <data> and <extra> parameters.

The live data values are available once per second.

11.1 Check current status

Command	LIVE?
Response	LIVE RUNNING <list> or LIVE STOPPED

Example

```
TX: LIVE?
     RX: LIVE RUNNING LAI
```

11.2 Start sending live data

One response will be returned per second until it is stopped.

Command	LIVE START <list>
Response	LIVE RUNNING <list> LIVE <data> <duration> <extra>

Example

```
TX: LIVE START LAEQ LAF
     RX: LIVE RUNNING LAF LAEQ
     RX: LIVE 9.73 10.27 2300.000 FFT
     RX: LIVE 10.36 10.62 2301.000 FFT
     RX: LIVE 10.12 10.62 2302.000 FFT
```

11.3 Stop sending data

Command	LIVE STOP
Response	LIVE STOPPED

11.4 Request a one-off set of live data

Command	`LIVE NOW <list>`
Response	`LIVE NOW <list>` `LIVE <data> <duration> <extra>`

<list> contains a list of data types.
<data> contains a list of values.
<duration> the run duration in seconds (to 3 decimal places).
`<extra>` contains state information which is always sent at the end of the list of values.

- Overload (1s)
  - T or F. (True or False)
- Measurement Overload
  - T or F. (True or False)
- Measurement Running
  - T or F. (True or False)

List of available data types.

Sound Pressure Level (SPL)	
L**xy**	Instantaneous
x is the Frequency Weighting (A, C or Z) **y** is the Time Weighting (F, S, or I)	
L**xy**MAXT	Overall
x is the Frequency Weighting (A, C or Z) **y** is the Time Weighting (F, S, or I)	
L**xy**MINT	Overall
x is the Frequency Weighting (A, C or Z) **y** is the Time Weighting (F, S, or I)	
Integrated Level (Leq)	
L**x**EQ	Most recent 1s
x is the Frequency Weighting (A, C or Z)	
LEQ2	Most recent 1s
LEQ3	Most recent 1s
L**x**EQT	
x is the Frequency Weighting (A, C or Z)	
LEQ2T	Overall
LEQ3T	Overall
Peak Level	
L**x**PEAK	Instantaneous
x is the Frequency Weighting (A, C or Z)	
L**x**PEAKT	Overall
x is the Frequency Weighting (A, C or Z)	
Octave Integrated Level	
OCT**z**	Most recent 1s
z is the Band Number (0 to 9) See table below.	

OCT**z**T	Overall
z is the Band Number (0 to 9) See table below.	
Third Octave Integrated Level	
3OCTz	Most recent 1s
z is the Band Number (0 to 35) See table below.	
3OCTzT	Overall
z is the Band Number (0 to 35) See table below.	
Statistical Levels	
LNz	Overall
z is the Ln Percentage (1, 5, 10, 50, 90, 95 or 99)	
USERLNz	Overall
z is the User Ln Number (1 to 7) Configured through NoiseTools.	

Notes:

- A data type with the suffix 'T' denotes an overall value.
  - When a measurement is in progress, it is the cumulative value over the current run duration.
  - When not measuring, it is the final value of the most recently completed measurement.
- A data type without this suffix is the current value, which can be:
  - Based on the most recent 1s. Example: LAEQ
  - An instantaneous value. Example: LAF
- Some instruments do not support all the values listed above.
  - Any unsupported values are ignored when requested and will not be in the returned list.
- Overall values requested before a measurement is started, are shown as 'NaN'. Alternatively if a measurement has been made previously those values will be shown.
  - Instruments without storage only support overall values while running.
- All decibel values are rounded to two decimal places.
- The data is in the order specified by the list returned from the LIVE START or LIVE NOW commands, not the order in which they were requested.

11.4.1 1:1 Octave Bands

Band Number	Frequency (Hz)
0	31
1	62.5
2	125
3	250
4	500
5	1000
6	2000
7	4000
8	8000
9	16000

11.4.2 1:3 Octave Bands

Band Number	Frequency (Hz)	Band Number	Frequency (Hz)	Band Number	Frequency (Hz)
0	6.3	12	100	24	1600
1	8	13	125	25	2000
2	10	14	160	26	2500
3	12.5	15	200	27	3150
4	16	16	250	28	4000
5	20	17	315	29	5000
6	25	18	400	30	6300
7	31.5	19	500	31	8000
8	40	20	625	32	10000
9	50	21	800	33	12500
10	62.5	22	1000	34	16000
11	80	23	1250	35	20000

Examples

```
TX: LIVE?
     RX: LIVE STOPPED
TX: LIVE START LAEQT LAF LAEQ LCPEAKT
     RX: LIVE RUNNING LAF LAEQ LAEQT LCPEAKT
     RX: LIVE 50.31 65.81 60.17 53.97 0.000 FFF
     RX: LIVE 50.32 65.82 60.17 53.96 0.000 FFF
     RX: LIVE 50.33 65.83 60.15 53.95 0.000 FFF
     RX: LIVE 50.34 65.84 60.13 53.91 0.000 FFF
TX: LIVE?
     RX: LIVE RUNNING LAF LAEQ LAEQT LCPEAKT
TX: LIVE START LAF
     RX: LIVE RUNNING LAF
     RX: LIVE 65.81 5.016 FFT
     RX: LIVE 65.82 6.016 FFT
     RX: LIVE 65.83 7.016 FFT
TX: LIVE STOP
     RX: LIVE STOPPED
TX: LIVE NOW LAEQT LAEQ
     RX: LIVE NOW LAEQ LAEQT
     RX: LIVE 50.35 60.16 17.500 FFT
```

12 Previous Measurement Data

Request a one-off set of data for the most recent completed measurement.

Command	PREV <list>
Response	PREV <list> PREV <data> <start date> <duration> <extra>

<list> contains a list of data types with suffix T only (items without T will report 'NaN').
<data> contains a list of acoustic corresponding to the types as ordered in the returned <list>.
<start date> Start date and time of the measurement in the same format as the CLOCK command.
<duration> Measurement run duration in seconds (to 3 decimal places).
<extra> is a single flag for the latched measurement overload.

Notes:

- The requested data types should only use overall values (with suffix T). Items without T will be return as 'NaN'.
- This command is only supported on instruments with the storage capability.
- <duration> added to Optimus Firmware v2.8.

Example

```
TX: PREV LAEQT LCEQT LCPEAKT LZPEAKT
     RX: PREV LAEQT LCEQT LCPEAKT LZPEAKT
     RX: PREV 47.91 56.92 89.15 89.18 2011-09-23T12:25:02 F
```

Example (v2.8 firmware or later)

```
TX: PREV LAEQT LCEQT LCPEAKT LZPEAKT
     RX: PREV LAEQT LCEQT LCPEAKT LZPEAKT
     RX: PREV 47.91 56.92 89.15 89.18 2011-09-23T12:25:02 1365.000
     F
```

13 Reboot

Reboot the instrument

Command	REBOOT
Response	REBOOT

Notes:

- The Instrument will wait 5 seconds before rebooting.

14 Examples of data communication

14.1 Instrument connection & live data

This example shows how to connect to an instrument and enable live data for monitoring purposes.

```
TX: IDN?
     RX: IDN CR:171B G786430 2.5.1839
TX: LIVE START LAF LAS LAEQ LCEQ LCPEAK
     RX: LIVE RUNNING LAF LAS LAEQ LCEQ LCPEAK
     RX: LIVE 84.50 83.20 64.35 67.59 87.84 0.000 FFF
     RX: LIVE 84.50 83.20 64.35 67.59 87.84 0.000 FFF
     RX: LIVE 84.50 83.20 64.35 67.59 87.84 0.000 FFF
     RX: LIVE 84.50 83.20 64.35 67.59 87.84 0.000 FFF
     RX: LIVE 84.50 83.20 64.35 67.59 87.84 0.000 FFF
     RX: LIVE 84.50 83.20 64.35 67.59 87.84 0.000 FFF
     …
```

14.2 Instrument connection, start measurement & get measurement results

This example shows how to connect to an instrument, make a measurement and get the results.

```
TX: IDN?
     RX: IDN CR:171B G786430 2.5.1839
TX: MEASURE START
     RX: MEASURE RUNNING
Wait 5 minutes
TX: MEASURE STOP
     RX: MEASURE STOPPED
TX: LIVE NOW LAFMAXT LASMAXT LAEQT LCEQT LCPEAKT LN90
     RX: LIVE NOW LAFMAXT LASMAXT LAEQT LCEQT LCPEAKT LN90
     RX: LIVE 85.50 84.20 65.35 68.59 88.84 42.50 300.000 FFF
```

When the instrument is stopped, the T commands (LAFMAXT, LASMAXT etc) return the data for the last measurement stored.

14.3 Repeating measurements

It is possible to configure the instrument via NoiseTools to use either the single timer or repeat timer to make measurements of the correct duration. If using the repeat timer see the multiple measurement example below.

This example shows how to connect to an instrument, start making a series of measurements and get the results.

```
TX: IDN?
     RX: IDN CR:171B G786430 2.5.1839
TX: MEASURE START
     RX: MEASURE RUNNING
Wait 5 minutes
TX: MEASURE STOP
     RX: MEASURE STOPPED
TX: MEASURE START
```

RX: MEASURE RUNNING
TX: PREV LAFMAXT LASMAXT LAEQT LCEQT LCPEAKT LN90
RX: PREV LAFMAXT LASMAXT LAEQT LCEQT LCPEAKT LN90 RX: PREV 85.50 84.20 65.35 68.59 88.84 42.50 2011-09-23T12:25:02 F
Wait 5 minutes *Repeat (STOP, START, PREV)*

If using repeat timers you do not need to run the START, STOP commands, simply wait the required amount of time then request the values with PREV.

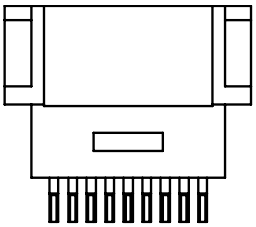
15 Appendix 1 Multi-IO RS232 Connector

The 18 pin Multi-IO connector on the optimus sound level meter provides access to the RS232 data signal. This connector should be used with the ZL:175 Optimus RS232 to PC Cable (see Appendix 2).

The connections for the 18 way socket are as follows:

Pin	Colour	Description
1		Not connected
2		Not connected
3	Black	Ext_On
4	Turquoise	AC Out
5	Grey	DC Out
6		Not connected
7	Green	DC Out
8	White	TX0
9	Yellow	CTS0
10	Blue	RX0
11	Brown	ACT1
12	Orange	CTS1
13	Pink	TX1
14		Not connected
15		Not connected
16	Red	External Power(12Vdc)
17	Purple	RX1
18	Braid	Ground

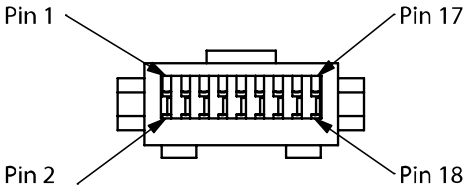
Note: BRAID to be connected to metal shield.



15.1 Connector part numbers

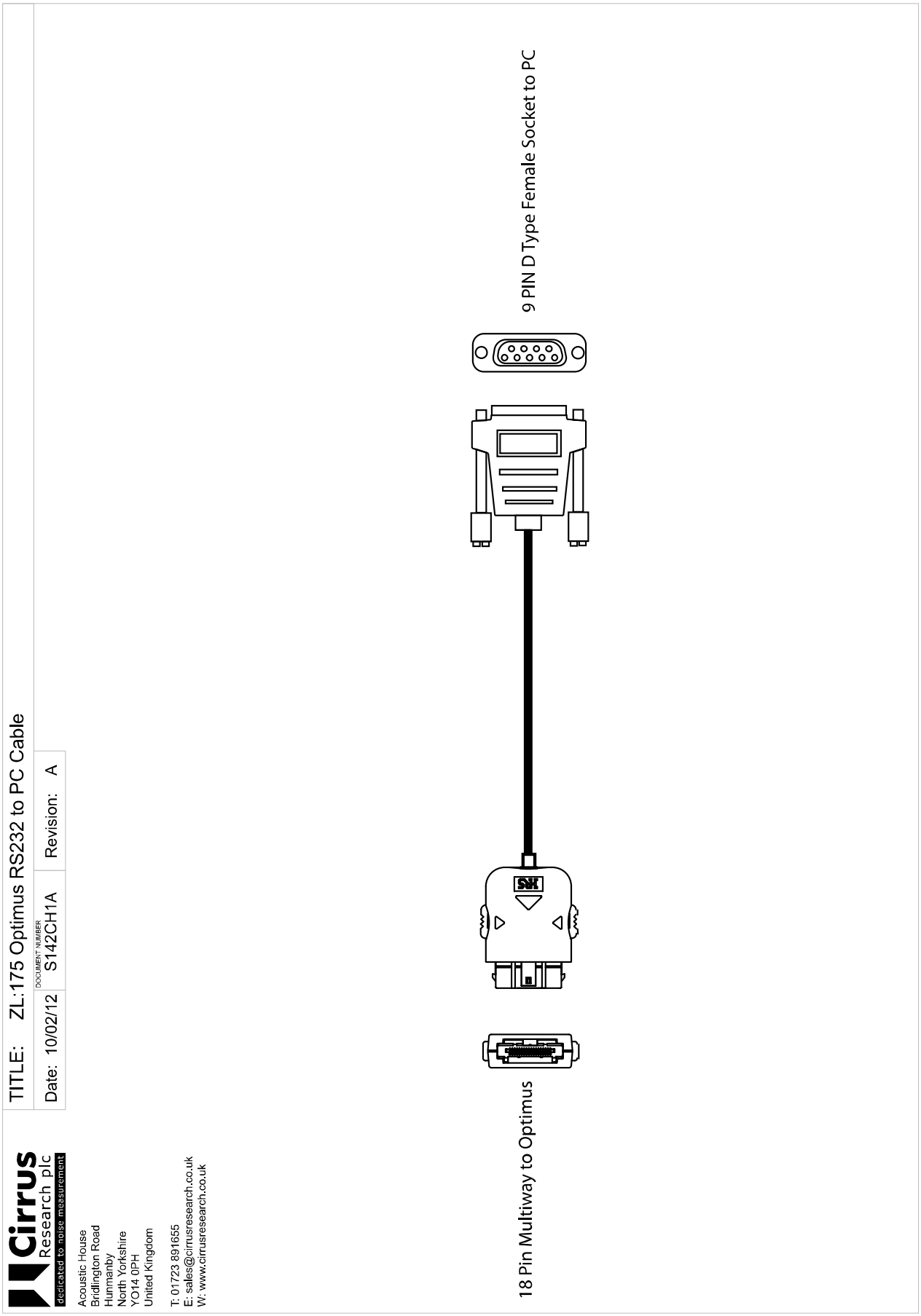
Hirose ST40 18-WAY PLUG - ST40X-18S-CVR (with shield)

Hirose - ST40X-CM(4.0-5.0) - CLAMP BRACKET



Rear View

16 Appendix 2 ZL:175 Optimus RS232 to PC Cable



17 Cirrus Research Offices

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