



**Delta Plus MOBILE II  
GSM/GPRS Class 10 with TCP/IP stack modem  
Part No: ASLH306**

**User Guide**

**DRAFT COPY**



## **Delta Plus MOBILE II GSM/GPRS Class 10 with TCP/IP stack modem**

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# **Delta Plus MOBILE II GSM/GPRS Class 10 With TCP/IP stack modem**

## **Hardware User Guide**

### **Guide to the manual**

This manual contains detailed technical information about the Delta Plus MOBILE II GSM/GPRS modem, including the commands necessary to configure and use it in your particular application. If you require further technical detail on this modem, please call our Technical Support Group.

### **Disclaimer**

This manual has been checked for accuracy. The information included in this document is pertinent to all versions of the Delta Plus MOBILE II GSM/GPRS modem at the time of publication. Subsequent products and manuals are subject to change without prior notification. Therefore ASLH Ltd. will take no responsibility for damages incurred, either directly or indirectly, from errors, omissions or inaccuracies between the product and the manual.

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### **Introduction**

Thank you for purchasing this ASLH Ltd modem, which is guaranteed for one year from the date of purchase. If, after reading this manual, you have any problems or queries regarding this modem, please contact ASLH Ltd. from whom the modem was purchased. In the unlikely event of you needing to return the modem to us, you must first call our Returns Department, to obtain a Return Authorisation Number (RAN). This number must be clearly marked on the outer packaging containing the faulty modem, and addressed for the

attention of the Returns Department. No goods will be accepted without a Return Authorisation Number.

Please enclose a copy of your original purchase invoice, to enable us to determine the warranty status. If no fault is found, a charge will be made to cover the costs of testing and carriage. Your original or replacement modem will be returned with an engineering report on the fault found. Thank you for your co-operation.

The Delta Plus MOBILE II is a new low powered high speed GSM/GPRS modem which has been specifically designed to meet the requirements of the telemetry market and specifically applications within the Automatic Meter Reading (AMR) arena.

The purpose of this manual is to enable the user to set up, configure and use the modem in a manner suitable for any given application. A basic level of modems and data communication technology is assumed.

## **Features**

DTE speeds up to 9600 bps

Bearer channel speeds of 9600 bps, 4800 bps, 2400 bps and 1200 bps.

Supports auto-dial and auto-answer on number of rings

NVRAM stores configuration parameters

Suitable for approvals/use in most countries

Interface is a 25 pin D-type RS232 Connector

Power supply input on pins 9 and 15 of 25-way "D" type connector

Auto Shutdown minimises RS-232 Power consumption during periods of inactivity.

Environment – Temperature : 0-50°C Humidity : 95% non condensing  
Enhanced AT command set.

Integrated call progress and dialling.

Advanced power supply handling techniques.

Remote access capability.

Dual Band - ie. E-GSM (900 Mhz) or GSM (1800 Mhz)

GPRS – Mobile Originate and Listen modes. (Class 10)

Internal battery option.

External power option

## **Connecting to your Terminal or Computer**

The 25 way D-type connector on the top of the modem provides the relevant input and output connections to asynchronous (Serial RS-232 and compatible) controllers. To establish a connection the modem can be directly connected to a suitable 25 way socket on your computer or other DTE device, or a short RS-232 cable can be used. When connecting the modem to the DTE device, consideration must be given to the power supply arrangements as most devices will not provide a suitable supply to the modem via the 25 way D-type connector.

The 25 way D-type connector is wired as follows:

Pin number, name and mnemonic:

|    |                             |     |
|----|-----------------------------|-----|
| 2  | Transmit Data               | TxD |
| 3  | Receive Data                | RxD |
| 4  | Request to Send             | RTS |
| 5  | Clear to Send               | CTS |
| 6  | Data Set Ready              | DSR |
| 7  | Signal Ground/Supply Ground | SG  |
| 8  | Data Carrier Detect         | DCD |
| 9  | Power In                    | PI  |
| 15 | Power In                    | PI  |
| 20 | Data Terminal Ready         | DTR |
| 22 | Ring Indicator              | RI  |

### **Supplying power to the modem**

The Delta Plus MOBILE II GSM/GPRS modem is powered via the RS232 interface connector. Pins 9 and/or 15 require a +7 to +24 Volts DC supply (issue F. board) Earlier issues of the board require +7 to +15Volts. The modem consumes 0.3 Watts. (See appendix). The supply to the modem is floated across internal SuperCaps. These devices hold a considerable charge and will allow the modem LED's to continue to function for several minutes after the removal of the power supply. This enables the modem to be used in environments where the power supply is either intermittent and/or inadequate (within reason) for a conventional modem product.

### **Battery powered version.**

The GSM/GPRS modem is also available as a battery powered device. The battery employed in the modem is a Lithium Ion Polymer type and is subject to a minimum duty cycle of 1000 operations.

The battery is fitted in addition to the "Super Caps" that are present in the standard modem and will power the modem for approximately two minutes after the external supply has been removed. This is regardless of whether or not the modem is on line. When the modem shuts down it will issue a "Goodbye" message to the interface.

Additionally the modem can be switched off using an AT command. The AT+K command will shutdown the entire modem (not just the Sony Ericsson module as is the case with other ASLH 306 products) within 15 seconds. If the power supply to the modem is not removed within 30 seconds

of the modem issuing the "Goodbye" message then it will commence its power up sequence and restart.

The battery powered modem will power up within 5 seconds after the external supply is applied given that the battery and capacitors are fully charged and that the modem is operating at room temperature. If the battery and capacitors are not fully charged and/or the modem is not operating at room temperature then the power up sequence will take longer.

## **Antennae.**

The Delta Plus MOBILE II GSM/GPRS modem is designed to work with many industry standard antennae. Connection to the antenna is via a flying lead terminated with a SMA type co-axial connector. The selection of the most suitable antenna in any given installation will be dependent upon factors such as the distance from the cell site, signal strength, power supply levels, and other physical constraints. ASLH Ltd. will be pleased to assist customers with the selection of suitable antennae.

## **Subscriber Identity Module card.**

This product requires a suitable Subscriber Identity Module (SIM) card inserted in the right hand side of the modem. The SIM card is provided by the network service provider eg. O2, Vodafone, Orange etc. This card must be data enabled, ie. a voice only SIM will not work. Additionally, if the product is to be used for GPRS applications then the SIM card must be GPRS enabled. This mode will be set as either mobile originate or terminate (IP listen) depending upon the users requirements.

ASLH Ltd. is able to provide network service supplied by the aforementioned companies.

## **Configuring the modem**

This is achieved by the use of the standard Hayes(™) AT command set as utilised in conventional land line modems. A comprehensive list of AT commands used by the Delta Plus MOBILE II GSM/GPRS modem follows.

## **AT Command set**

AT+ commands should be used alone, not concatenated ie AT+Y<cr> not AT+YS0=1<cr> etc).

AT A

Answer mode enable

Causes the modem to answer an incoming call.

AT D

Dial Command

Causes the modem to go on line and dial the following telephone number subject to parameters set in the dial string.

eg: ATDT 12345 123456^m

Where "D" = Dial, "T" = Tone (Compatibility only), ^m = Carriage return.

AT E

Local Echo in command mode.

AT E0 = Local Echo off

AT E1 = Local Echo on

AT H

Hang Up command.

This command causes the modem to disconnect from the telephone line.

AT I

Identifier command.

ATI 0 displays: GR47

ATI 1 displays: CXC1122528

ATI 3 displays: GR47 Cable Modem

ATI 5 displays, for example:

Configuration Settings on Channel 0

&C: 1

&D: 0

\*E2IPA: 0

\*E2IPO: 0

\*E2IPS: 2,10,2,1020

\*EENMEA: 0

+CGATT: 1

+CGEREP: 0,0



+CGREG: 0,1  
+CHSR: 0  
+CHSU: 0  
+CMEE: 0  
+CMUX: 0,0,1,31,10,3,30,10,2  
+CR: 0  
+CRC: 0  
+CRLP: 61,61,48,6,0  
+CRLP: 120,120,48,6,2,3  
+CVHU: 2  
+ICF: 3,3  
+IFC: 2,2  
+ILRR: 0  
+IPR: 9600  
E: 1  
M: 0  
Q: 0  
S0: 001  
S10: 002  
S2: 043  
S3: 013  
S4: 010  
S5: 008  
S6: 002  
S7: 050  
S8: 002  
V: 1  
X: 4

Due to the architecture of the interface circuitry not all of the above commands will necessarily be displayed each time.

ATI 7 displays: GR47 Profile

Interfaces: System Bus

ATI 9 displays: (\$ERI0044\MODEM\GR47 Cable Modem0D)

AT O

Return to on line state command

This command returns to modem to the on line data transmission state following an on line command mode session. ie. it is used to return to data mode after the +++ escape sequence has been entered.

AT Q

Quiet mode. Defines whether or not messages generated by the modem are sent to the DTE.

AT Q0 = Quiet mode off

AT Q1 = Quiet mode on

AT V

Verbose mode enable. Defines whether the above messages are displayed as readable text or numeric values.

AT V0 = Verbose mode disabled

AT V1 = Verbose mode enabled

AT X

Result codes. These are the messages generated by the modem when connection or disconnection is attempted.

There are 5 sets of result codes available (numbered 0 - 4). The ATX command is used to select which result code set to use. The selection of the result code set, also affects the way the modem detects dial tone and busy tones.

ATX0 Selects the Basic code set. In this mode dialling will be carried out regardless of whether a dial tone is detected or not (this is called Blind Dialling). If successfully connected, the 'CONNECT' message will be returned from the modem. No indication is made as to the speed the modem is connected at.

ATX1 - Selects the extended result code set. Connection is as for X0 except that the modem now indicates the connection speed in the connect message, e.g.

"CONNECT 300" when connected at 300bps, "CONNECT 1200" when connected at 1200bps.

ATX2 - Same as ATX1 with the addition of dial tone detection.

ATX3 - Same as ATX1 with the addition of busy tone detection.

ATX4 - Same as ATX1 with addition of dial tone and busy tone detection.

These commands are for compatibility only.

AT Z

Modem Reset

Resets the modem without changing any parameters

## AT &C

Carrier control. This parameter defines the operation of pin 8 (DCD) of the RS 232C interface.

AT &C0 = Always on

AT &C1 = Fixed to this setting – Carrier goes high when on line.

AT &C3 = Off in command mode – On when modem on line

For compatibility only. ie modem will respond with OK but not take any action.

## AT &D

### Data Terminal Ready options

This command controls the handling of the DTR line. (Pin 20).

AT&D0 - DTR state is ignored and no action is taken. This is the equivalent of holding DTR permanently active (high).

AT&D1 - Returns the modem to command mode on loss of DTR. This is the same as issuing the +++ escape sequence, i.e. the modem will go into command mode, but will not drop the line.

AT&D2 - Prevents the modem from originating or answering a call unless DTR is raised by the DTE, and if the modem is online when DTR drops, the call will be disconnected.

## AT &F

### Restore Factory Configuration

Configures the modem to factory default settings  
(Does not default AT+ autosave commands).

## AT&V

This command shows the general set up of the modem. Displays, for example (Version 3.03 firmware):

```
at&Ve?v?q?x?&c?&d?s0?s2?s3?+cbst?
```

```
306 v3.03 S1 1200N G0 P0
```

```
E: 1
```

```
V: 1
```

```
Q: 0
```

```
X: 4
```

```
&C: 1
```

```
&D: 0
```

```
001 (S reg. 1)
```

```
043 (S reg. 2)
```

013  
+CBST: 0,0,1

OK

(On earlier versions of the modem, pre version 2.08 firmware, less information is displayed when this command is issued).

Due to the architecture of the interface circuitry not all of the above commands will necessarily be displayed each time.

Issue 3 Hardware:

This displays additional S and P status:

S displays the status of the interface ie.

S0 - The interface is set for sleep mode.  
S1 - The interface is permanently on – default.

(Set using AT+A auto shutdown command).

P displays the modem power consumption.

P0 - The modem is set for low power consumption.  
P1 - The modem is set for high power consumption.

(Set using AT+P command).

AT &W

Write configuration to non-volatile RAM.

N.B. – AT+ commands are autosave and therefore execution of this command is not necessary to save these to memory.

A/

Re-execute last command.

+++ - TIES (Time Independent Escape Sequence) – When issued to the modem in an “on line” state this command will place the modem into “on line” command mode.

\*\*\* - Remote Access command. – When this command is issued from a remotely connected modem it will enable the remote user to interrogate and configure the ASLH306 device.

AT+A RS232 auto shutdown control - toggles on / off

It echoes:

AT+A if auto-shutdown is on (ie RS232 in sleep mode).

AT+a if auto-shutdown is off (ie RS232 on all the time).  
(Autosave)

AT+Gn

AT+G0 - turns off GPRS mode.

AT+G1 - turns on GPRS mode and selects the APN.

(Autosave)

AT+I reports ASLH 306 firmware version number, RS232 auto off state (1 = always on), baud rate, N or E for parity. (F/W dependent)

AT+K Turns Sony Ericsson(™) module off. (Up to F/W version 2.11).

Version 2.12 onwards turns off the complete modem.

AT+O Turns Sony Ericsson(™) module on. (Assuming modem is turned on).

The AT+0 command is no longer implemented ie No turning on of the Sony Ericsson module on issue 3 hardware boards.

AT+P Power Consumption control. This command allows the modem to be set for either low or high power consumption. (P0 = low, P1 = high). P0 should be used when the DTE is unable to supply high current. P1 should be used when the DTE power supply current rating is not an issue.

AT+R Resets modem. (Up to F/W version 3.01).

Version 3.02 onwards causes the modem to execute a 10 second power cycle.

AT+S Displays Signal Strength, toggles on / off (default off).

Remote AT+S reports last known Signal Strength.

From firmware version 3.02 the sample rate of the signal strength algorithm is increased.

AT+T Commands modem to dial a stored number held in "ME" memory location.

AT+n Set baud rate / parity. This is automatically saved.

When set to no parity, the Sony Ericsson(™) module will still respond to AT commands with even parity.

AT+0 9600 N81

AT+1 9600 E71

AT+2 4800 N81

AT+3 4800 E71

AT+4 2400 N81

AT+5 2400 E71

AT+6 1200 N81

AT+7 1200 E71

(Autosave)

## Sony Ericsson commands

GPRS related:

=====

AT+CDGCONT Define PDP Context.

AT+CDGCONT = n,"IP","APN address"

AT\*ENAD Ericsson Internet Account Define.

AT\*ENAD = n,"GPRS","username","password",1,0

PAYG SIM related:

=====

AT+CPBS Phone Book Store

AT+CPBS="ME" (Use "ME" memory location).

AT+CPBW Phone Book Write

AT+CPBW=n,"phone number",number system,"text"  
(See PAYG support section).

AT+CPBR Phone Book Read

AT+CPBR=n (Where n is the "ME" memory location).

Remote Access related:

=====

To interrogate the modem to check if Remote Access is enabled:

at\*e2apc?

Response: \*E2APC: 0,0,0,0 (Not enabled)

To enable Remote Access:

Issue two commands to modem (306)

at\*e2apd=3,0

at\*e2apc=1,1

Write configuration change to NVRAM:

AT&W

Interrogate modem:

at\*e2apc?

Response: \*E2APC: 0,1,0,0

Power cycle the modem.

Interrogate modem:

at\*e2apc?

Response: \*E2APC: 1,1,0,0 (Remote Access enabled)

General

=====

AT+CGMR

This command will cause the Sony Ericsson module to display its type/version.

Response: R6A023 CXC1122528 (Example).

AT+CBST?

This command gives information regarding the cellular network bearer channel.

Response: 0,0,1 (Autobaud rate, Asynchronous, Non transparent).

## S Registers:

|                                   |                                     |
|-----------------------------------|-------------------------------------|
| S0= Number of rings to answer.    | Range 0-7 (Default 0 – No answer)   |
| S2= Escape sequence character     | Range 0-255 (Default 43 = +)        |
| S3= CR character                  | Range 0-127 (Default 13 - Cntrl M)  |
| S4= LF character                  | Range 0-127 (Default 10 - Cntrl J)  |
| S5= Back space character          | Range 0-127 (Default 8 -Backspace)  |
| S6= Wait before blind dialling    | Range 2-255 (Default 2 – 2 secs)*   |
| S7= Wait for carrier              | Range 1-255 (Default 50 – 50 secs)  |
| S8= Comma Pause time              | Range 1-255 (Default 2 – 2 secs)*   |
| S10= Carrier loss to hang up time | Range 1-254 (Default 2 – 0.2 secs)* |

\* Compatibility only

## Modem result codes:

| Numeric | Verbose | Legend                                |
|---------|---------|---------------------------------------|
| 0       | OK      | Command line executed without errors. |

|   |              |                                |
|---|--------------|--------------------------------|
| 1 | CONNECT      | Connection.                    |
| 2 | RING         | Ringing signal detected.       |
| 3 | NO CARRIER   | Carrier lost or never present. |
| 4 | ERROR        | Invalid Command.               |
| 6 | NO DIAL TONE | No dial tone detected.         |
| 7 | BUSY         | Busy signal detected.          |
| 8 | NO ANSWER    | No answer from remote modem.   |

## **GPRS operation**

The three main commands used to set up a GPRS call with the Delta Plus MOBILE II GSM/GPRS modem in listening mode are as follows:

AT+Gn, where n = 0 to 9

AT+G0 - turns off GPRS mode

AT+G1-9 turns on GPRS mode and auto connects using context 1-9 then listens for a port 23 connection.

If AT+Gn is on ( ie n = 1-9 ) then it will restart if the connection fails, also at power up. To set contexts (n = 1-9) in the following two commands:

AT+CDGCONT = n,"IP","Enter access point name (APN) address here"

AT\*ENAD = n,"GPRS","username","password",1,0

To escape from TCP/IP listening mode when a session is not connected issue a Ctrl C.

This can take several minutes to “detach” from the network and will set AT+G0 until +G is changed or a reset or a power cycle is invoked. This will set the modem back into auto mode.

Firmware version 2.10 and above:

Additional GPRS watchdogs have been added to the modem in order to negate network fail conditions, these ensure that the unit continually re-tries to connect in GPRS mode if a call failure is detected.

Timeouts:

Typically these are –

Online GPRS inactivity timeout of 4m 16s (256 seconds) - covers failure mid session

User exit from GPRS mode (Ctrl C) times out & GPRS restarts after 1m 42 secs unless the AT+G command is used.

Fail safe timeout restarts every 3h 37.6 minutes if unit is offline. Covers random GPRS network failures!

Lack of Signal/Signal Quality (SQ) timeout is 45 minutes.



## Remote Access

The ASLH 306 modem has the ability to be remotely accessed for both testing and configuration purposes. This is achieved as follows:

1. Establish a normal dial up connection to the ASLH 306 modem.
2. Issue the “\*\*\*” command to the modem from the remote modem.
3. The ASLH 306 will respond with an OK.
4. You are now connected to the remote 306 PIC interface.
5. If access to the Sony Ericsson module is required issue the AT+Z command to the remote modem.
6. The ASLH 306 will respond with:  
RC  
OK
7. Drop the dial up connection.
8. Re-establish the dial up connection again within 60 seconds.
9. You are now in communication with the Sony Ericsson module within the ASLH 306 modem.
10. Only AT commands proprietary to the Sony Ericsson module can now be used.
11. There is no method of returning to on-line mode following a remote access session and therefore the call must be terminated and a new call initiated.

Please note that the remote access feature only works when the modem interface is set for 8 data bits, no parity and 1 stop bit.

## Pay As You Go (PAYG) SIM Support

This feature has been included as part of the solution to the requirement for the use of Pay As You Go SIM's. PAYG SIM use demands that at least one phone call is originated from the number in a six month period in order to keep the service live. The meters used by the Electricity supply industry typically have no inherent intelligence, and therefore do not have the ability to originate a call to satisfy this requirement. This situation can be circumvented by use of a central site server designed to call the modems on a cyclical basis and instruct them to call into a pre-defined server number, which can be verified by the use of the CLI issued by the network provider. To this end the execution of the AT+T command causes the modem to dial an internally stored number automatically. This command can be executed both locally or remotely, ie. via the modem RS 232C interface or from a remotely connected modem. Once a connection has been established with the 306 modem the \*\*\* command is issued from the remote modem causing the 306 to enter online command mode whereupon the AT+T command can be issued.

Activate locally or remotely with:

at+t

Modem will then dial number in ME memory 1 (see below).

To store a number:

1/. Set memory to internal memory (not SIM):

at+cpbs="ME" (Phone Book Store command)  
OK

2/. Add number:

Text at end can be any characters. Use number system 145 for international type numbering, or 129 for UK type numbering (see example below).

at+cpbw=1,"441339755397",145,"Top-up" (Phone Book Write command)  
OK

3/. Save!

at&w  
OK

4/. To read it back, if you wish!

at+cpbr=1 (Phone Book Read command)  
  
+CPBR: 1,"441339755397",145,"Top-up"  
OK

5/. To use manually:

atd>ME1

CONNECT 9600

The quick brown fox jumps over the lazy dog. (Data)

NO CARRIER

6/. UK numbering example:

at+cpbw=1,"01339755081",129,"Home"  
OK

## **LED Status (GSM Mode) Version 2.02 & 2.05**

### Red LED:

Off for module off.  
On when unregistered with network.  
Flashes when registered with network.

### Green LED:

Slow flash is off line.  
Fast flash is on line.

### Yellow LED:

Off / Slow flash / On - with increasing signal level.

## **LED Status (GPRS Mode) Version 2.08 and above**

When listening in GPRS you can identify the status of the unit :

### Red LED:

Off for module off.  
On when unregistered with network.  
Flashes when registered with network.

### Green LED:

Slow flash is off line.  
Fast flash is on line. - not as fast as GSM online state, but faster than in GSM offline state. Fast flash when not registered – low supply voltage.  
Very fast flash (Pulsing) – Full auto reset following loss of network.

### Yellow LED:

Off / Slow flash / On - with increasing signal level.  
Short flash to indicate the difference between no SQ yet found during initialisation and off indicating low Signal Quality.

On issue 3 hardware boards Signal Quality LED sensitivity now set down to 10. (Was 12).

## **Technical Specifications**

### Configuration and Rates

9600 bps, 4800 bps, 2400 bps, 1200 bps.

Data Format

10 bit character length including parity, start and stop bits.

1 start bit.

7 or 8 data bits.

0 or 1 parity bit.

Modem Operation

Controlled by AT commands and supporting S registers.

Data Modulation.

V22 - 1200 bps

V22bis - 2400 bps

V32 2400 – 9600 bps

V110 2400 – 56000 bps

Fax Group 3, Class 1 & 2

HSCSD (2+1), up to 28.8 kbps

GPRS Class B (4+1), up to 85.6 kbps

Equipment Interface

CCITT V.24/V.28

GPRS – Mobile Originate and Listen modes. (Class 10)

# Appendices

- Appendix 1 Hardware and software compatibility
- Appendix 2
- Appendix 3 Power supply requirements
- Appendix 4 Glossary
- Appendix 5 Conversion tables

# Appendix 1

## Hardware and software compatibility

### ASLH306 Firmware revision chart V4.0b

| F/W Version                      | 10.69   | 2.01    | 2.02    | 2.02    | 2.05    | 2.08    | 2.10    | 2.11 /<br>2.12                  | 3.01    | 3.03    | 3.10             | 3.11            |
|----------------------------------|---------|---------|---------|---------|---------|---------|---------|---------------------------------|---------|---------|------------------|-----------------|
| Sony Ericsson Module             | R5B003  | R5B003  | R5B003  | R5B003  | R5B003  | R5B003  | R6A023  | R5B003                          | R6A023  | R6A023  | R6A023           | R6A023          |
| PIC version                      | 4220    | 4220    | 4220    | 4220    | 4320    | 4320    | 4320    | 4320                            | 4320    | 4320    | 4260             | 4260            |
| PCB version                      | C       | C       | C       | C       | C       | C       | C       | C                               | F       | F       | G                | G               |
| GSM                              | Yes     | Yes     | Yes     | Yes     | Yes     | Yes     | Yes     | Yes                             | Yes     | Yes     | Yes              | Yes             |
| GPRS Originate                   | No      | Yes     | Yes     | Yes     | Yes     | Yes     | Yes     | Yes                             | Yes     | Yes     | Yes              | Yes             |
| GPRS Terminate (Listen)          | No      | No      | No      | No      | No      | No      | No      | No                              | Yes     | Yes     | Yes              | No              |
| Remote Access                    | No      | Yes     | Yes     | Yes     | Yes     | Yes     | Yes     | Yes                             | Yes     | Yes     | Yes              | Yes             |
| Remote access to Sony module     | No      | Yes     | Yes     | Yes     | Yes     | Yes     | Yes     | Yes                             | Yes     | Yes     | Yes              | Yes             |
| Battery                          | No      | No      | No      | Yes     | Yes     | Yes     | Yes     | Yes                             | Yes     | Yes     | Yes              | Yes             |
| External Power Lead              | No      | No      | No      | No      | No      | No      | No      | No                              | Yes     | Yes     | Yes              | Yes             |
| High Power                       | No      | No      | No      | No      | No      | No      | No      | Yes                             | Yes     | Yes     | Yes              | Yes             |
| Revised SQ display               | No      | No      | No      | No      | No      | No      | No      | Yes                             | Yes     | Yes     | Yes              | Yes             |
| Pay as you Go call back          | No      | No      | No      | No      | No      | No      | No      | No                              | No      | Yes     | Yes              | Yes             |
| Short Message Service            | No      | No      | No      | No      | No      | No      | No      | No                              | No      | No      | No               | No              |
| Remote config (Firmware)         | No      | No      | No      | No      | No      | No      | No      | No                              | No      | No      | No               | Yes             |
| OWP supported                    | No      | No      | No      | No      | No      | No      | No      | No                              | No      | No      | No               | Yes             |
| Network Watch Dog                | Yes     | Yes     | Yes     | Yes     | Yes     | Yes     | Yes     | Yes                             | Yes     | Yes     | Yes              | Yes             |
| Network Watchdog inc power cycle | No      | No      | No      | No      | No      | No      | No      | Yes                             | Yes     | Yes     | Yes              | Yes             |
| Release Status                   | archive | archive | archive | archive | archive | archive | archive | NIE<br>evaluation<br>units only | archive | archive | Released<br>23/7 | Not<br>Released |

## Appendix 2

## Appendix 3

Peak power supply requirements:

| Power supply voltage (V) | Peak power supply current (mA) |
|--------------------------|--------------------------------|
| 7                        | 220                            |
| 8                        | 190                            |
| 9                        | 170                            |
| 10                       | 150                            |
| 11                       | 140                            |
| 12                       | 130                            |
| 13                       | 120                            |
| 14                       | 110                            |
| 15                       | 100                            |

Issue f and issue e + mod is able to work over an increased range:

|    |    |
|----|----|
| 16 | 95 |
| 17 | 90 |
| 18 | 85 |
| 19 | 80 |
| 20 | 75 |
| 21 | 72 |
| 22 | 70 |
| 23 | 66 |
| 24 | 64 |

(Calculated figures based on power consumption of 1.5 watt)



# Appendix 4

## Glossary of terms and abbreviations

# Appendix 5

## Converting Hex to Decimal

Here's a chart that shows the conversion between hex and decimal.

|   | 0   | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 000 | 001 | 002 | 003 | 004 | 005 | 006 | 007 | 008 | 009 | 010 | 011 | 012 | 013 | 014 | 015 |
| 1 | 016 | 017 | 018 | 019 | 020 | 021 | 022 | 023 | 024 | 025 | 026 | 027 | 028 | 029 | 030 | 031 |
| 2 | 032 | 033 | 034 | 035 | 036 | 037 | 038 | 039 | 040 | 041 | 042 | 043 | 044 | 045 | 046 | 047 |
| 3 | 048 | 049 | 050 | 051 | 052 | 053 | 054 | 055 | 056 | 057 | 058 | 059 | 060 | 061 | 062 | 063 |
| 4 | 064 | 065 | 066 | 067 | 068 | 069 | 070 | 071 | 072 | 073 | 074 | 075 | 076 | 077 | 078 | 079 |
| 5 | 080 | 081 | 082 | 083 | 084 | 085 | 086 | 087 | 088 | 089 | 090 | 091 | 092 | 093 | 094 | 095 |
| 6 | 096 | 097 | 098 | 099 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 |
| 7 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 |
| 8 | 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 | 143 |
| 9 | 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 |
| A | 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 |
| B | 176 | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 |
| C | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 |
| D | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 |
| E | 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 |
| F | 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 |

# Converting Hex to Octal

Here's a chart that shows the conversion between hex and octal.

|   | 0   | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | A   | B   | C   | D   | E   | F   |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 0 | 000 | 001 | 002 | 003 | 004 | 005 | 006 | 007 | 010 | 011 | 012 | 013 | 014 | 015 | 016 | 017 |
| 1 | 020 | 021 | 022 | 023 | 024 | 025 | 026 | 027 | 030 | 031 | 032 | 033 | 034 | 035 | 036 | 037 |
| 2 | 040 | 041 | 042 | 043 | 044 | 045 | 046 | 047 | 050 | 051 | 052 | 053 | 054 | 055 | 056 | 057 |
| 3 | 060 | 061 | 062 | 063 | 064 | 065 | 066 | 067 | 070 | 071 | 072 | 073 | 074 | 075 | 076 | 077 |
| 4 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 |
| 5 | 120 | 121 | 122 | 123 | 134 | 125 | 126 | 127 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 |
| 6 | 140 | 141 | 142 | 143 | 144 | 145 | 146 | 147 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 |
| 7 | 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 170 | 171 | 172 | 173 | 174 | 175 | 176 | 177 |
| 8 | 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 |
| 9 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 |
| A | 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 250 | 251 | 252 | 253 | 254 | 255 | 256 | 257 |
| B | 260 | 261 | 262 | 263 | 264 | 265 | 266 | 267 | 270 | 271 | 272 | 273 | 274 | 275 | 276 | 277 |
| C | 300 | 301 | 302 | 303 | 304 | 305 | 306 | 307 | 310 | 311 | 312 | 313 | 314 | 315 | 316 | 317 |
| D | 320 | 321 | 322 | 323 | 324 | 325 | 326 | 327 | 330 | 331 | 332 | 333 | 334 | 335 | 336 | 337 |
| E | 340 | 341 | 342 | 343 | 344 | 345 | 346 | 347 | 350 | 351 | 352 | 353 | 354 | 355 | 356 | 357 |
| F | 360 | 361 | 362 | 363 | 364 | 365 | 366 | 367 | 370 | 371 | 372 | 373 | 374 | 375 | 376 | 377 |

# Index

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