

Communications Hub Supporting Information

Version 1.2

June 2016

This document has been prepared on the basis of the current Industry Codes and Arrangements, SEC Subsidiary Documents and Relevant Documents. It may be updated, replaced or obsoleted in due course. Other documents may supersede this document

1. Document History

1.1 Version control

1.1.1 In accordance with clause 1.5 of CH Handover Support Materials, DCC shall only make material modifications to this Supporting Information where it has:

- a) undertaken reasonable consultation with stakeholders regarding the proposed modification;
- b) given due consideration to, and taken into account, any consultation responses received; and
- c) published a statement of its reasons for the modification together with copies of any consultation responses received that are not marked as confidential.

1.1.2 DCC further commits to publish an up-to-date copy of the Supporting Information on its website as soon as reasonably practicable following any such modification.

1.2 Document Revisions

Version	Comments	Date Issued
1.0	Post consultation version	30 June 2015
1.1	Changes to the technical specification of Communications Hubs, the inclusion of information on aerial types and wait timings.	March 2016
1.2	Post-consultation changes following review comments.	June 2016

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2. Introduction

2.1 Document Purpose

2.1.1 This document provides additional information for SEC Parties in relation to the packaging, labelling, Advanced Shipment Notification file formats, CH Status Information of Communications Hubs and outline descriptions for aerial types. Such information will provide Parties with additional technical detail and guidance to that set out in Appendices [H and I] of the SEC (these being the CH Handover Support Materials and the CH Installation & Maintenance Support Materials respectively).

2.1.2 The supporting information provided in this document includes:

- a) information regarding Communications Hub labelling;
- b) Advanced Shipment Notification file formats;
- c) additional graphical information supporting the definition of Significant Metallic Obstruction;
- d) a description of the way in which LED indicators depict the operational status of a Communications Hub;
- e) a description of the aerial types DCC make available within the South and Central Regions; and
- f) a definition of the wait times necessary to initiate reboot functionality and to completely power down the Communications Hub.

3. Labelling and ASN format

3.1.1 Annex E of CH Installation and Maintenance Support Materials describes the equipment which the DCC will supply, by region, in relation to its fulfilment of Communications Hub Orders.

3.2 Communications Hub Labels

3.2.1 The DCC will meet its obligation in clause 5.4 of the CH Handover Support Materials for it to permanently mark the identification information onto the front face of each Communications Hub, by laser-etching the Communications Hub labelling information specified in Annex A of the CH Handover Support Materials onto the front face of each Communications Hub. As detailed in the aforementioned clause 5.4, the front face is the face of the Communications Hub which contains the M4 retaining screw, as referenced in the CH Installation and Maintenance Support Materials.

3.2.2 The Communication Hub labelling shall be formatted and positioned as follows:

- a) the CHF Identifier shall be located on the front face in EAN 128 barcode format with human-readable plain text below that barcode;
- b) the WAN Variant shall be located above the CHF Identifier;
- c) both the CHF Identifier and WAN Variant information shall be visible directly through a cut-out in the Communications Hub packaging;
- d) the GPF Identifier shall be located below and to the right of the CHF Identifier in EAN 128 barcode format with human-readable plain text below this barcode;
- e) the GPF Identifier shall be located below the bottom of the CHF Identifier label and offset to the right of the centre of the CHF Identifier label to avoid mis-scanning; and
- f) the Zigbee MAC address as specified by GBCS shall be presented in human-readable form and located on the front face of the Communications Hub.

3.2.3 The WAN Variant labels shall be as follows:

- a) South Region and Central Region
 - SKU1 Cellular
 - SKU2 Cellular + Mesh
 - SKU3 SIMCH
- b) North Region
 - Standard 420
 - Variant 450

3.3 ASN File Format

3.3.1 The DCC shall provide the ASN file for Communications Hub deliveries in CSV file format. The file shall be formatted as defined in clause 5.1 of CH Handover Support Materials.

3.3.2 The field formats for the data items in the ASN file are further described in Appendix A of this document.

4. Metallic Obstructions

4.1 Significant Metallic Obstructions

4.1.1 Effective operation of the wireless SM WAN communications technology of the Communications Hub requires that it is not installed in a location where:

- a) the Communications Hub is located within an earthed, metallic enclosure (i.e. a Faraday cage); or
- b) the Communications hub is installed in a location with a Significant Metallic Obstruction on 3 or more sides, relevant to the top, front, left and right faces of the Communications Hub (with the front face being the face that holds the M4 retaining screw).

4.1.2 With the measurements as illustrated in Figure 1, Significant Metallic Obstruction means:

- a) for the North Region, any metallic object where any dimension 'X' parallel to the relevant face of the Communications Hub is 32cm or greater and any second dimension 'Y' parallel to the relevant face of the Communications Hub is 18cm or greater, and where the object is situated within distance 'D' of 18cm or less of that face when installed; or
- b) for the Central Region and South Region, any metallic object where any dimension 'X' parallel to the relevant face of the Communications Hub is 16cm or greater and any second dimension 'Y' parallel to the relevant face of the Communications Hub is 8cm or greater, and where the object is situated within distance 'D' of 8cm or less of that face when installed.

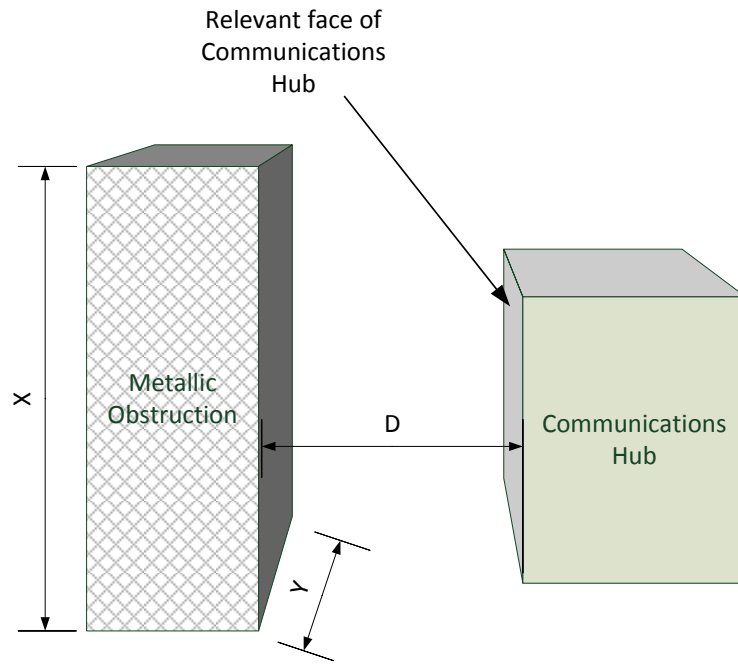


Figure 1; Metallic Obstruction

5. CH Status Information

- 5.1.1 The operational status of the Communications Hub shall be indicated by the LEDs as set out in Appendix B of this document.
- 5.1.2 The wait timings required to initiate reboot functionality and completely power down the Communications Hub are set out in Appendix C of this document.

5.2 CH Status Information for the North Region

- 5.2.1 For the North Region, Communications Hubs will indicate their current operational status via two LED indicators clearly visible on the front face of the Communications Hub (all WAN Variants), which will provide information regarding;
 - a) Power and SM WAN connection state (WAN); and
 - b) HAN connection state (HAN).

5.3 CH Status Information for the Central Region and South Region

- 5.3.1 For the Central Region and South Region, Communications Hubs will indicate their current operational status via five LED indicators clearly visible on the front face of the Communications Hub (all WAN Variants) which will appear in this order and provide information regarding the following:
 - a) Device power/operating state (SW);
 - b) SM WAN connection state (WAN);
 - c) Wireless mesh connection state for a cellular + mesh or SIMCH Device Model (MESH);
 - d) HAN connection state (HAN); and
 - e) Gas Proxy Function (GAS).

- 5.3.2 Communications Hubs provided by the DCC in the Central Region and South Region will also have a 'signal checker' operational status, used to indicate SM WAN signal strength using the LED indicators. This state will be enabled automatically for a period of 1 minute following installation of an aerial, as described in Section B.2 of CHIMSM, to support SEC parties in optimisation of aerial positioning.
- 5.3.3 In 'signal checker' mode, the number of LEDs lit on a Communications Hub indicates the relative signal strength to that Communications Hub. The greater the number of LEDs lit, the greater the signal strength. A minimum of one LED lit is required to indicate that the Communications Hub is able to connect to the SM WAN.

6. Auxiliary equipment

6.1 Aerial types – South and Central Region

6.1.1 The DCC shall provide aerial types in the South and Central Regions as described below. More than one aerial model may be provided within these type specifications and full details are provided through the manufacturer data sheets which will be published to Parties by DCC as part of an aerial information pack.

Data sheets are published using the following path on the DCC web site www.smartdcc.co.uk :

> Implementation > Design and Assurance > Communications Hubs > Communications Hubs Product Information

An introductory overview of the aerial types is as follows:

- a) T1 Aerial Type. This aerial type is low gain. It is estimated that 6% of all installations (approximately 57-60% of Mesh Communications Hub installations) will require this aerial type. There are two aerial models of this type and both have a 1,500mm lead with aerial dimensions of either:
 - i) 165mm x 30mm x 20mm; or
 - ii) 145mm x 95mm x 50mm
- b) T2 Aerial Type. This aerial type is high gain. It is estimated that 4% of all installations (approximately 37-40% of Mesh Communications Hub installations) will require this aerial type. There are two aerial models of this type and both have a 1,500mm lead with aerial dimensions of either:
 - i) 365mm x 30mm x 20mm; or
 - ii) 425mm x 100mm x 55mm
- c) T3 Aerial Type. This aerial type is high gain. It is estimated that less than 0.5% of all installations (approximately 3-5% of Mesh Communications Hub installations) will require this aerial type. The aerial may be externally mounted. The size of the T3 models varies and will in all cases conform to planning guidance.

Appendix A. ASN data item field formats

A.1.1. Table 1 describes the field formats for all data items in the Communications Hub ASN file.

Table 1; ASN data item field formats

Field	Format
1. CHF ID (EUI-64 unique number);	Text (max 23) e.g. 10-AB-AC-12-12-23-24-C5
2. Communications Hub WAN Variant;	Text (max 50 chars)
3. GPF ID (EUI-64 unique number);	Text (max 23) See CHF Id
4. Zigbee MAC Address;	Text (max 23) See CHF Id
5. SM WAN Identifier;	Text (max 50 chars)
6. DCC order reference;	Text (max 50 chars)
7. Party order reference;	Text (max 50 chars)
8. Party consignment reference;	Text (max 50 chars)
9. Delivery Location;	Text (max 200 chars)
10. Scheduled Delivery Date and time;	DD/MM/YYYY HH:MM
11. Firmware version number;	Text (max 50 chars)
12. Hardware version number;	Text (max 50 chars)
13. Device configuration identifier;	Text (max 50 chars)
14. Manufacturer, country and date of manufacture;	Text (max 200 chars)
15. Batch number;	Text (max 50 chars)
16. Reconditioned status;	Text (max 3 chars - Yes / No)
17. Pallet identifier;	Text (max 50 chars)
18. Quantity of cartons on the pallet;	Number, max 2 digits
19. Carton Identifier; and	Text (max 50 chars)
20. Quantity of Communications Hubs in carton.	Number, max 2 digits
21. Quantity of pallets in consignment	Number, max 2 digits

Appendix B. LED State Indicators

B.1. Operating State

B.1.1. Table 2 details the LED State Indicators ‘on and off’ times for each of the three operating states – “normal”, “transitional” and “error”. The corresponding flashing frequency is described as being low, medium or high frequency flashing.

Table 2; Communications Hub LED state indicators - frequency (all LEDs)

Description	LED ON Time	LED OFF Time	Indication
HIGH FREQUENCY FLASH (HFF)	100ms	500ms	Indicates error operating state
MEDIUM FREQUENCY FLASH (MFF)	100ms	2000ms	Indicates transitional operating state
LOW FREQUENCY FLASH (LFF)	100ms	5000ms	Indicates normal operating state

B.2. Region North - Communications Hub LED Descriptions

B.2.1. In the North Region, Communications Hubs will have the LED functionality as described in this sub section.

B.2.2. Of the two LEDs on the front of the Communications Hub, the LED on the left (nearest the securing screw) shall indicate the Communications Hub power and SM WAN connection statuses and the LED on the right shall indicate the status of the Communications Hub HAN connection. The SM WAN LED and the HAN LED shall be bi-colour (green and red).

B.2.3. Table 3 shows the operational status table for Region North Communications Hubs.

Table 3; Region North Communications Hub operational status table

Operational status		Indication	Duration	Supplier Party Action
Power State	<i>Power off</i>	No light	N/A	Check power and replace Comms Hub. Repeat failure indicates ICHIS host issue.
	<i>Power on, device initialising (normal operating state)</i>	SM WAN / Power LED SOLID GREEN	Maximum 30 secs	Perform reset of Comms Hub (see Appendix C) if maximum time exceeded. Replace Hub on repeat failure

Operational status		Indication	Duration	Supplier Party Action
	<i>Power on, device in error state (error state)</i>	SM WAN / Power LED HIGH FREQUENCY GREEN	Maximum 5 secs (before automatic reboot)	Perform reset of Comms Hub (see Appendix C) if state does not change. Replace Hub on repeat failure
SM WAN State	<i>SM WAN initialising (normal operating state)</i>	N/A (See Power on, device initiating)	N/A (See Power on, device initiating)	See Power on, device initiating
	<i>Attempting to connect to the SM WAN (normal operating state)</i>	SM WAN / Power LED MEDIUM FREQUENCY GREEN	Maximum 5 minutes	Party may undertake the CH No SM WAN Coverage Installation Procedure where duration is exceeded.
	<i>SM WAN connected (normal operating state)</i>	SM WAN / Power LED LOW FREQUENCY GREEN	N/A - final normal operating state	N/A
	<i>SM WAN error (normal operating state)</i>	SM WAN / Power LED HIGH FREQUENCY GREEN	Maximum 5 secs (before automatic reboot)	Perform reset of Comms Hub (see Appendix C) if state does not change. Replace Hub on repeat failure
HAN State	<i>Power off, HAN not functioning</i>	No light	N/A	Check power and replace Comms Hub. Repeat failure indicates ICHIS host issue.
	<i>HAN initialising (normal operating state)</i>	HAN LED MEDIUM FREQUENCY RED	Maximum 60 secs	Perform reset of Comms Hub (see Appendix C) if maximum time exceeded. Replace Hub on repeat failure
	<i>HAN initialised, no HAN devices in CHF Device Log (normal operating state)</i>	HAN LED SOLID GREEN	N/A - pending Device Log update	Take necessary steps to add HAN Devices to CHF Device Log as set out in GBCS
	<i>HAN in 'permit join' mode (normal operating state)</i>	HAN LED MEDIUM FREQUENCY GREEN	Up to 60 mins from Device Log update	Take necessary steps to add HAN Devices to HAN (initiate pairing according to device specification)
	<i>HAN initialised, one or more HAN devices in CHF Device Log (normal operating state)</i>	HAN LED LOW FREQUENCY GREEN	N/A - final normal operating state	N/A

Operational status		Indication	Duration	Supplier Party Action
	<i>HAN in error state (error state)</i>	HAN LED HIGH FREQUENCY GREEN	Maximum 5 secs (before automatic reboot)	Perform reset of Comms Hub (see Appendix C) if state does not change. Replace Hub on repeat failure
	<i>HAN Device join success</i>	HAN LED SOLID RED	Displayed for 5 seconds following successful Zigbee HAN join	N/A
	<i>HAN Device join failure</i>	HAN LED HIGH FREQUENCY RED	Displayed for 5 seconds following unsuccessful Zigbee HAN join	Re-try adding Device to CHF Device log and attempt re-join

B.3. Central and South Regions - Communications Hub LED Descriptions

B.3.1. In the Central and South Regions, Communications Hubs will have the LED functionality as described in this sub section.

B.3.2. As specified, a Communication Hub will have, on the front face of the enclosure, five LED indicators, with the following labels:

- a) SW: indication of software state on the Communications Hub
- b) WAN: status of connection to the SM WAN network
- c) MESH: status of connection to the Mesh network (for Cellular + Mesh and SIMCH variants only – not used for this purpose on SKU1 Cellular)
- d) HAN: status of connection to the HAN
- e) GAS: status of the Gas Proxy Function

B.3.3. Table 4 shows the operational status table for Regions Central and South Communications Hubs.

Table 4; Regions Central and South Communications Hub operational status table

Operational status		Indication	Duration	Supplier Party Action
Power State	<i>Software integrity check or no power indicated</i>	No light	Maximum 40 secs	Check power and replace Comms Hub. Repeat failure indicative of ICHIS host power issue.

<i>Operational status</i>		Indication	Duration	Supplier Party Action
	<i>Device initialising (normal operating state)</i>	All LEDs transition from SOLID GREEN to LOW FREQUENCY to OFF - 5 LEDs solid green (no flash) for 10 secs - 5 LEDs low freq flash for 10 secs - Switch off for 10 secs	Maximum 30 secs, each transition 10 secs Duration 10 secs Each transition 10 secs	Perform reset of Comms Hub (see Appendix C) if maximum time exceeded. Replace Hub on repeat failure
Software state	<i>Normal operating state</i>	SW LED LOW FREQUENCY GREEN	N/A - final normal operating state	N/A
	<i>Device in error state</i>	SW LED HIGH FREQUENCY GREEN	Maximum 60 secs	Perform reset of Comms Hub (see Appendix C) if maximum time exceeded. Replace Hub on repeat failure
SM WAN State	<i>SM WAN initialising (normal operating state)</i>	WAN LED SOLID GREEN	Maximum 10 secs Remains on for 10 secs	Perform reset Comms Hub (see Appendix C) if maximum time exceeded. Replace Hub on repeat failure
	<i>Attempting connect to SM WAN</i>	WAN LED MEDIUM FREQUENCY GREEN	Maximum 40 secs	If maximum duration is exceeded, Supplier Party should refer to the Installation and Fitting procedure
	<i>SM WAN connected (normal operating state)</i>	WAN LED LOW FREQUENCY GREEN	N/A - final normal operating state	N/A
	<i>SM WAN error</i>	WAN LED HIGH FREQUENCY GREEN	Maximum 60 secs	Perform reset of Comms Hub (see Appendix C) if maximum time exceeded. Replace Hub on repeat failure
HAN State	<i>Power off, HAN not functioning</i>	HAN LED No light	N/A	Check power and replace Comms Hub. Repeat failure indicates ICHIS host issue.

Operational status		Indication	Duration	Supplier Party Action
	<i>Power on, HAN initialising (normal operating state)</i>	HAN LED SOLID GREEN	10 seconds	Perform reset of Comms Hub (see Appendix C) if maximum time exceeded. Replace Hub on repeat failure
	<i>HAN initialised, no HAN devices in CHF Device Log (normal operating state)</i>	HAN LED off	N/A	Take necessary steps to add HAN Devices to CHF Device Log as set out in GBCS
	<i>HAN in 'permit join' mode (normal operating state)</i>	HAN LED Medium frequency flash	3600 seconds	Take necessary steps to add HAN Devices to HAN (initiate pairing according to device specification)
	<i>HAN initialised, one or more HAN devices in CHF Device Log (normal operating state)</i>	HAN LED LOW FREQUENCY GREEN	Continuous	N/A
	<i>HAN in error state</i>	HAN LED HIGH FREQUENCY GREEN	Continuous	Perform reset of Comms Hub (see Appendix C) if state does not change. Replace Hub on repeat failure
Mesh connection state Only relevant to Mesh + Cellular (SKU2) or SIMCH (SKU3)	<i>Power off</i>	MESH LED No light	N/A	NB: only for Mesh + Cellular & SIMCH. Where WAN LED indicates no Connectivity Check power and replace Comms Hub.
	<i>Power on, mesh initialising</i>	MESH LED SOLID GREEN	10 seconds	NB: only for Mesh + Cellular & SIMCH. Where WAN LED indicates no Connectivity Perform reset Comms Hub (see Appendix C) if maximum time exceeded. Replace Hub on repeat failure
	<i>Attempting to connect to Mesh</i>	MESH LED MEDIUM FREQUENCY GREEN	40 seconds	Party may undertake the CH No SM WAN Coverage Installation Procedure where state does not change

<i>Operational status</i>		Indication	Duration	Supplier Party Action
	<i>Mesh Connected</i>	MESH LED LOW FREQUENCY GREEN	Continuous (while Mesh connected)	N/A
	<i>Mesh routing error</i>	MESH LED HIGH FREQUENCY GREEN	60 seconds	Where SM WAN LED indicates connected (normal operating state), no action is required. Where SM WAN LED does not indicate a connected state, perform reset of Comms Hub (see Appendix C) if maximum time exceeded. Replace Hub on repeat failure
GPF state	<i>Power off or no device added to GPF Device Log</i>	GAS LED No light	N/A	Add Device to GPF Device Log and complete Device Join process as set out in GBCS
	<i>Device successfully added to GPF Device Log</i>	GAS LED LOW FREQUENCY GREEN	Continuous	N/A
	<i>GPF in error state</i>	GAS LED HIGH FREQUENCY GREEN	60 seconds	Retry adding Device to GPF Device Log. Perform reset of Comms Hub (see Appendix C) and replace Hub on repeat failure
Signal Checking state	<i>Aerial attached to powered Communications Hub</i>	ALL LEDs light to indicate strength of SNMWAN signal – number of LEDs lit increases with signal strength	State enabled for 1 minute from point at which aerial connected	Optimise aerial position to maximise SM WAN signal strength

Appendix C. Reset (reboot and power down) timings and processes

C.1.1. Table 5 details the procedures and timings for undertaking a reset of a Communication Hub, for each Variant in each Region.

Where a Party wishes to reset a Communications Hub in order to resolve an issue, then the soft reset (reboot) should be tried first followed by a hard reset (power down) where the soft reset does not resolve the issue.

Table 5; Communications Hub wait timings

Region	WAN Variant	Soft reset (Reboot)	Hard reset (Power down)
North	All WAN Variants	The Communications Hub can be unseated from a powered ICHIS host for at least 10 seconds and then re-seated, triggering a reboot.	<p>The Communications Hub can either:</p> <ul style="list-style-type: none"> • be unseated from a powered ICHIS host for at least 15 minutes and then re-seated; or • remain seated on the ICHIS host and power removed from the ICHIS host for at least 15 minutes. <p>Note that 15 minutes allows for temporary power storage in the CH to discharge.</p>
South and Central	All WAN Variants	<p>The Communications Hub can either:</p> <ul style="list-style-type: none"> • be unseated from a powered ICHIS host for at least 3 minutes and then re-seated; or • remain seated on the ICHIS host and power removed from the ICHIS host for at least 3 minutes 	