Intimate Communications Hub

Interface Specification

Author **DCC**
V~~1.2~~2.0
~~20 December 2018~~ 09 July 2019

Data Communications Company

Contents

Part A Framework

A1.0 Introduction

The Intimate Communications Hub Interface (ICHI) specification defines a common interface between Intimate Communications Hubs (ICH) and Smart Meters which will be deployed for the GB Smart Metering Implementation Programme. At the time of writing, only Electricity Smart Metering Equipment (ESME) are appropriate to provide the capability defined in ICHIS, as well as Hot Shoes and Cradles which can convert an ICH into a Stand-Alone Communications Hub (SACH). Hot Shoes are the ICHI suitable for use with Gas Smart Metering Equipment (GSME). The document is structured in such a way to allow future expansion to include other devices.

The ICHI specification defines the mandatory features required to ensure that an ICH can be used with any ICHIS compliant Host, as well as defining features reserved for future use or for CSP specific implementation.

This specification has been produced by and is owned and maintained by SmartDCC Ltd. It is published on the SmartDCC Ltd website, and is free to access and use. Once published, the specification is managed under the SmartDCC Ltd's change control process.

The specification shall be reviewed as a minimum by SmartDCC Ltd and its ICHIS WG on an annual basis to ensure it remains fit for purpose and use. Outside of the annual review, if a user of the specification should identify any changes or updates that are required, please contact SmartDCC Ltd via email to contact@smartdcc.co.uk detailing the proposed change and accompanying rationale for the change. Should proposed changes be identified by either the annual review process or via a formal change request the document will be revised by SmartDCC Ltd and any proposed changes consulted with SEC (Smart Energy Code) parties. Where the specification is updated following this process it will be re-published via the SmartDCC Ltd's website and consultation response.

A2.0 Scope

A2.1 In-Scope

This document will define the interfaces for the:

- Intimate Communications Hub and similar Devices defined in Part A4.0 0 using the same interface; and
- ESME and similar Hosts defined in Part A4.00 using the same interface.

The definitions cover the:

- Mechanical interface;
- Power supply provided from a Host to a Communications Hub;
- Tamper detection; and
- External dependencies and recommended good practice.

This document also provides descriptions for interoperability testing required to ensure compliance, including testing for RF interference between the ESME and CH.

A2.2 Out of Scope

The items below are outside the scope of this specification.

- All functionality otherwise provided by the CH
- All functionality otherwise provided by the ~~ESME~~ Host
- Protocols for communications and data transfer including security between a ~~ESME~~ Host and a CH
- Requirements of protective covers used for covering the ICHI during shipping which will not be left in place by installers (as opposed to Blanking Plates used throughout the rest of this document which are intended to stay affixed to a Host after Installation).
- Aesthetics of the ~~ESME~~ Host and the CH unit
- Physical dimensions of the ~~ESME~~ Host and the CH that are not otherwise covered or prohibited by this specification
- HMI (Human Machine Interface) of Hosts or Devices

A3.0 References to Standards

Item	Standard Number	Title
1	BS EN 50470-1:2006 + A1: 2018	Electricity metering equipment (a.c.) – Part 1: General requirements, tests and test conditions – Metering equipment (class indexes A, B and C)
2	BS EN 50470-3:2006 +A1:2018	Electricity metering equipment (a.c.) – Part 3: Particular requirements – Static meters for active energy (class indexes A, B and C)
~~3~~	~~Proposed IEC 62052-31~~	~~Electricity metering equipment (AC) – General requirements, tests and test conditions – Part 31: Safety Requirements~~ ~~**NOTE:** this document is under development and is currently at CDV stage in November 2013~~
3~~4~~	BS EN 55032:2015~~22~~	~~Information technology equipment. Radio disturbance characteristics. Limits and methods of measurement~~ Electromagnetic compatibility of multimedia equipment. Emission Requirements
4~~5~~	BS EN 60529: BS EN 60529:1992+A2:2013 ~~2015~~	Specification for degrees of protection provided by enclosures (IP code)

Item	Standard Number	Title
56	BS EN 60603-8:1998 Part C	Connectors for frequencies below 3MHz for use with Printed boards
67	BS EN 61204-3:2000181 Part 3	Low voltage power supplies DC output part 3, electromagnetic compatibility (EMC)
78	BS EN 7856:20137	Design of alternating current watt-hour meters for active energy
89	ETSI EN 301 489-1 v2.1.1	Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements
910	IEC BS EN 60060-1:2010	High voltage test techniques
11	EN 62684:2011	Interoperability specifications of common external power supply (EPS) for use with data-enabled mobile telephones
1012	BS7671:20108	Requirements for Electrical Installations. IET Wiring Regulations
1113	BS7540 EN 50565-1:2014	Electric cables. Guide to use for cables with a rated voltage not exceeding 450/750 V (U0/U). General guidance
1214	ETSI EN 300 220-1 v3.1.1(2017-02)	Section 8.4.2 – Blocking Method of Measurement

Note: The above list addresses the requirements relevant to the interface between the ESME Host and the CH. It does not necessarily address all the requirements for the ESME Host or the CH.

A4.0 Detail of Products

This specification covers a number of products which may implement the ICHIS. These products fall into two distinct roles, which are used as generic terms in this document. These roles correspond loosely to providing DC power and mechanical support (Host), or mounting on a Host to draw power or simply cover the interface (Device).

To be compliant to this Intimate Communications Hub Interface Specification a manufacturer shall declare which of these product types the product complies to and shall comply with all of the General Requirements of this specification, as well as all of the Specific Requirements for that product type.

The products are described below:

Product	Description	Role
ESME	An ESME capable of providing physical mount for an ICHIS Device, as well as providing power. This Device is further defined in SMETS2.	Host
GSME	An GSME only when designed capable of providing a physical mount for an ICHIS Device, as well as providing power. This Device is further defined in SMETS2.	Host
Communications Hub	The CH draws power from a Host, as well as being physically mounted via it. This Device is further defined in CHTS.	Device
Hot Shoe	The Hot Shoe converts an ICH to a SACH by providing: ▪ A physical mount separate to an ESME, connected to the mains supply (eg meter tails). ▪ DC power as an output to the Devices supply for the CH.	Host
Blanking Plate	The Blanking Plate covers the ICHIS interface on an ESME when no other ICHIS Device is in use. There are no active electronics in a Blanking Plate. It is simply a cover to provide the Host with appropriate ingress and security/safety protection.	Device

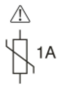
Product	Description	Role
Adaptor	The Adaptor mounts on an ICHIS-compliant ESME or Hot Shoe and supplies power to a Cradle via a flying lead. The Adaptor provides appropriate protection to the flying lead, depending on which signals it carries from the ESME.	Device
Cradle	The Cradle draws power from an Adaptor, providing power and physical mounting to an ICHIS Communications Hub.	Host

A5.0 Glossary

Term	Description
AC	Alternating Current
Adaptor	The Adaptor mounts on an ICHIS-compliant ESME or Hot Shoe and supplies power to a Cradle via a flying lead. ~~Later revisions of this specification may include a requirement to carry additional signals over the flying lead, but this is not currently required.~~
BEAMA	The British Electrotechnical and Allied Manufacturers Association
Blanking Plate	A cover to provide the Host with appropriate ingress and security protection when no other ICHIS Device is in use.
CH	Communications Hub compliant with Communications Hub Technical Spec (CHTS) and this ICHIS, mounted as either an ICH or SACH.
CHAS	Communication Hub Antenna Structure
CHTS	Communications Hub Technical Specification
Cradle	A mount for an ICHIS Device, attached via a flying lead to an Adaptor mounted to a Host, allowing an installer to place the Communications Hub on a Cradle in a different location to the ESME or Hot Shoe.
CSP	Communications Service Provider, as contracted to the Data Communications Company in Great Britain. Arqiva is the CSP in the North region, Telefónica are the CSP in the Central and South regions

Term	Description
DC	Direct Current
DCC	Data Communications Company in Great Britain.
Device	The side of an ICHIS interface which draws power from an ICHIS Host, and derives physical stability from the mount.
DSP	Data Service Provider, as contracted to the Data Communications Company in Great Britain.
ESD	Electrostatic Discharge
ESME	Electricity Smart Metering Equipment, as defined in SMETS2
GSME	Gas Smart Metering Equipment as defined in SMETS2
HAN	Home Area Network
Host	The side of an ICHIS interface which provides power and a physical mount for a Device.
Hot Shoe	The Hot Shoe converts an ICH to a SACH by providing: ▪ A physical mount separate to an ESME ▪ A safe power supply connected to the mains as an input. ▪ DC power as an output to the Device. The Hot Shoe allows an installer to place the Communications Hub in a different location to the ESME, and/or to provide power to the Communications Hub without an ICHIS compliant ESME.
ICH	Communications Hub compliant with Communications Hub Technical Spec (CHTS) and this ICHIS, mounted directly on an ESME.
ICHI	Intimate Communications Hub Interface
ICHIS	This document - the Intimate Communications Hub Interface Specification
ICHIS Test Specification	The document detailed in Part F2.1 that sets out how Hosts are tested.

Term	Description
ICHIS WG	Intimate Communications Hub Interface Specification Working Group. This group is chaired by DCC and is attended by meter manufacturers and Communication Service Providers (CSPs). Suppliers. Other relevant experts can also attend meetings if requested and at DCC's discretion.
Installation	Any combination of Hosts and Devices, including any intermediate flying leads.
L_{load}	The connection to the consumers wiring – connected to the right hand main terminal of a single phase ESME.
L_{supply}	The connection from the public supply network – connected to the left hand main terminal of a single phase ESME.
N	Neutral
Noise Limit	The maximum level of noise originating from the Host in dB above thermal noise.
PLC	Power Line Communication
PSU	Power Supply Unit
RF	Radio Frequency
RMM	Reserved for Meter Manufacturer
SACH	Stand-Alone Communications Hub, not directly connected to an ESME via the intimate interface.
SMETS2	Smart Metering Equipment Technical Specifications, version 2 onwards
~~SSWG~~	~~Smart Specification Working Group~~
WAN	Wide Area Network
WG	Working Group
⚠ 0.25A	AC output symbol

Term	Description
	Fuse output symbol
	PPTC Fuse symbol

A6.0 Revision history

Version	Date	Reason for release
0.1	2013-04-05	BEAMA-produced draft for SMIP ISFT
0.3	2013-12-23	SmartDCC Ltd draft version published for consultation, including updates to mechanical drawings following tolerance review
1.0	2014-02-28	Initial SmartDCC Ltd iteration following consultation feedback
1.1	2018-11-12	Changes to Part F on installation of a Host emitting RF noise at 423MHz
1.2	2018-12-20	Changes to Part F on installation of a Host emitting RF noise in the 900MHz, 2.4GHz (HAN) and 868MHz (HAN) frequency bands.
2.0	2019-07-09	Changes as a result of a review and consultation. Including: ▪ Removing the Bit Error Rate (BER) test requirement; ▪ Moving the Radio Frequency Noise Limits from the Communications Hub (Comms Hub) datasheets to ICHIS; ▪ Replacing current test content in ICHIS with a new Test Specification link; ▪ Adding requirements to test multiple meters; ▪ Retesting considerations; ▪ Adding a new appendix for CHAS information; and ▪ Making other minor changes to the specification.

Part B Mechanical Interface

B1.0 General requirements for mechanical interface

All dimensions within this ICHI Specification are in millimetres (mm).

B1.1 Details of mechanical dimensions

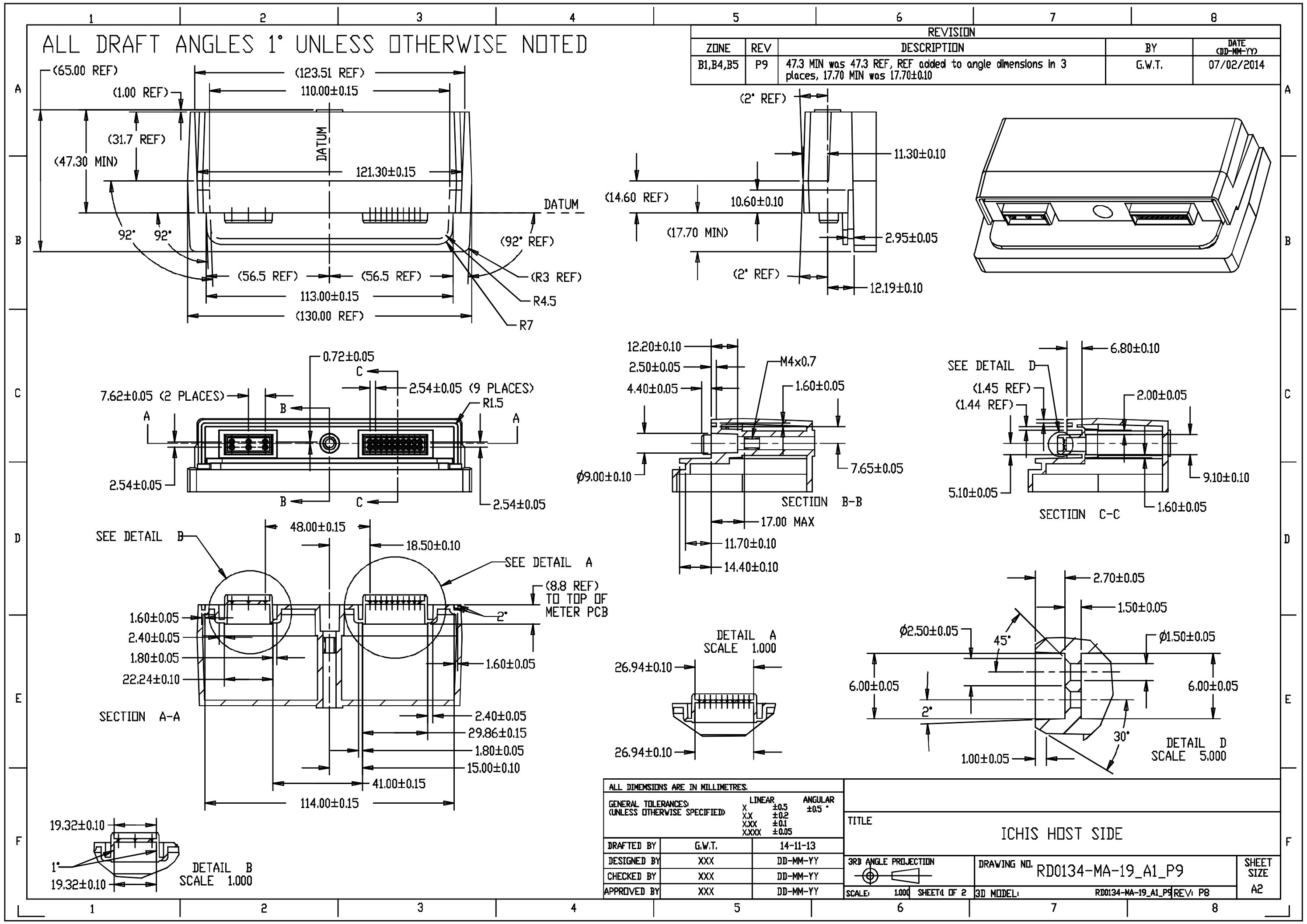
This section describes the mandatory mechanical requirements for each side of the Intimate Communications Hub Interface.

It allows a Device to be fitted to a Host

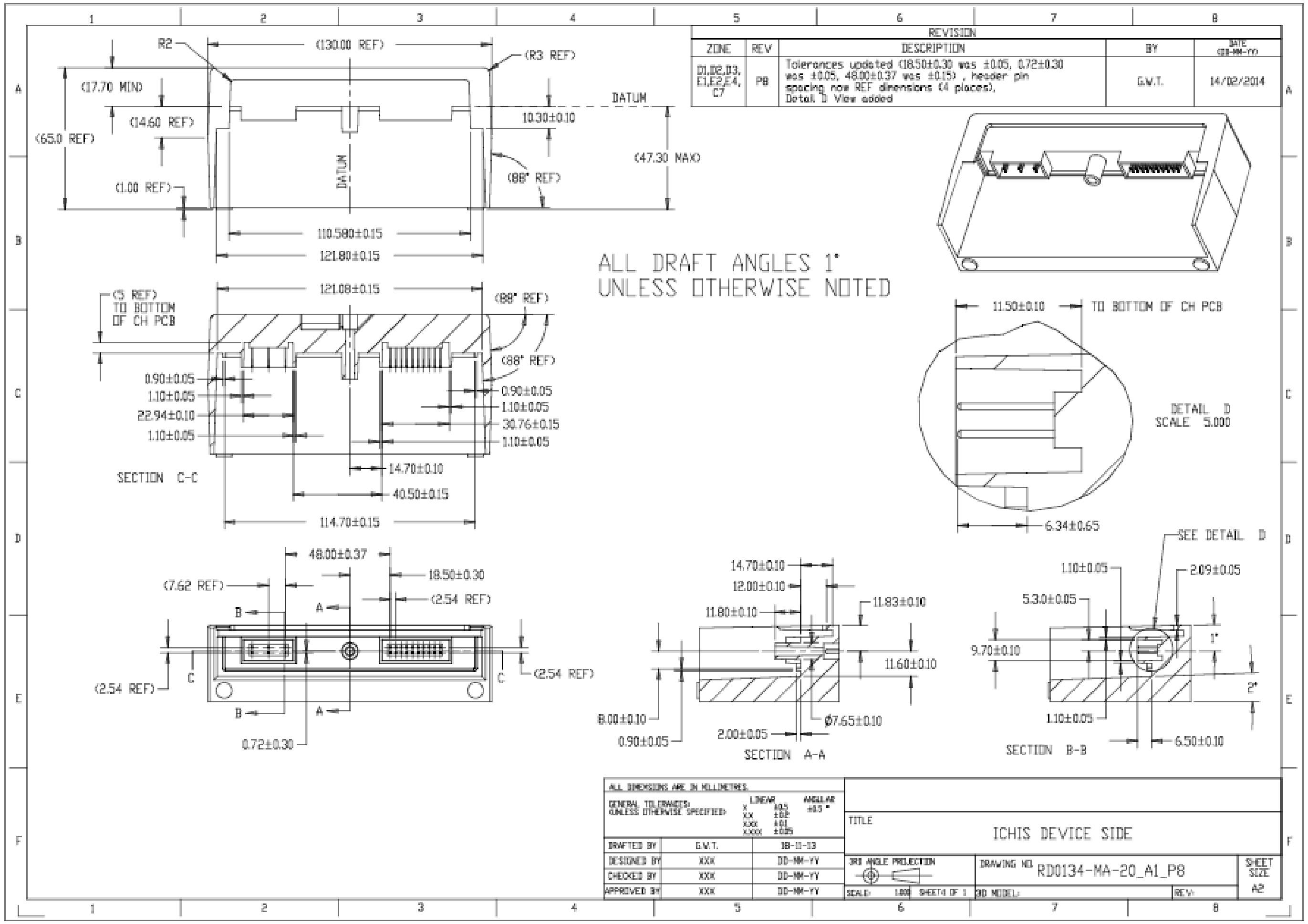
The 2D reference drawings in Part B1.2 and B1.3 are the definitions of this mechanical interface – high resolution copies and CAD files are available on the SmartDCC Ltd website. The 3D models available on the SmartDCC Ltd website have been provided as information only for manufacturers. If there is any conflict between any of the above, the drawings listed below serve as the reference. (Note: For QA purposes the datum location in the drawings may need to be changed to a more stable part of the moulding)

Role	Reference document
Device	RD0134-MA-20_A1_P8.pdf
Host	RD0134-MA-19_A1_P9.pdf

B1.2 Reference drawing of the Host



B1.3 Reference drawing of the Device interface



B1.4 DC and signalling connector details

B1.4.1 Specific requirements for Devices

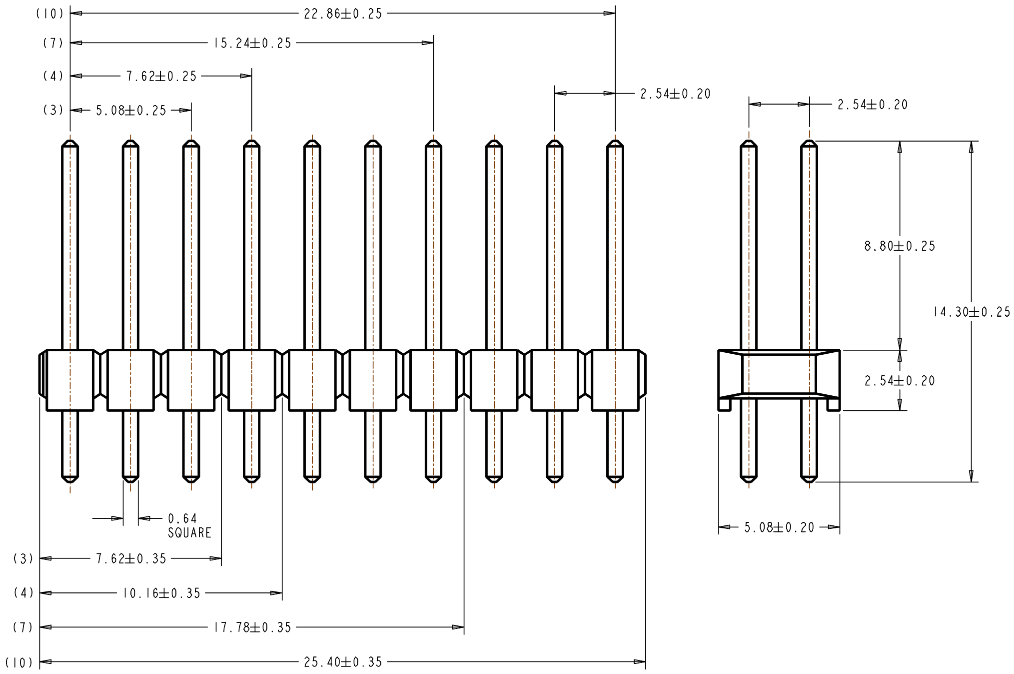


Figure B1.4-1 Connector Diagram

Figure B1.4-1 shows the dimensions of an example of the male header used on the Device. The Device shall populate a 2x3 pin DIL header (IEC-C203MS-S1 or IEC-C203MR-S1), in order to support power supply and tamper detection. Refer to Part E for the mandatory and optional pins of each Device type.

B1.4.1.1 Standards applicable to the male connector

The connector shall conform to BS EN 60603-8 style “C” in all respects other than the fixed contact length, which shall be increased to 8.8mm as shown in the drawing above. This increased length is to allow for mouldings between the male and female headers.

B1.4.2 Specific Requirements for Hosts

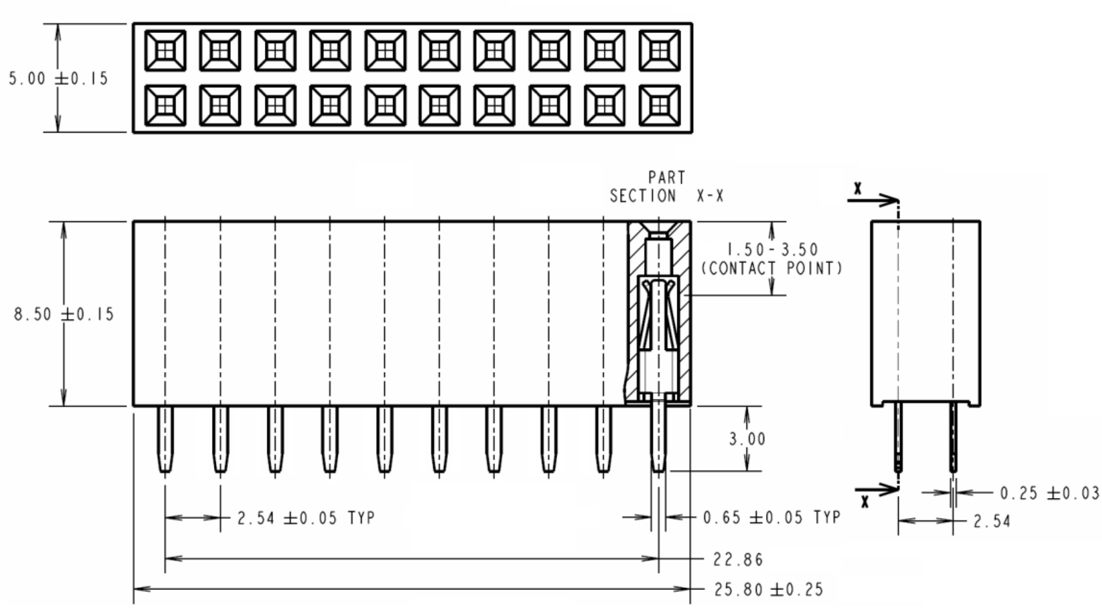


Figure B1.4-2 Socket Diagram

Figure B1.4-2 shows the dimensions of the female header used on Hosts. It is a mandatory requirement that at least a 2x3 DIL header (IEC-C203FS-S1) be provided, although a Host shall also be able to accept a connection from a Device with the full 2x10 CH pin positions populated. This may be achieved with a larger connector with all positions populated, a large connector left partially populated, or a small connector together with voids in the moulding.

The connector shall be selected and positioned to ensure that the male pins on the Device can reliably connect with the female contacts.

B1.4.2.1 Standards applicable to the female connector

The connectors conform to BS EN 60603-8 style “C”.

B1.5 Ingress Protection rating

The interface shall achieve an IP rating of IP53 as the ICH shall be able to achieve a rating of IP53 when fitted to a Host.

The minimum IP rating for an ESME compliant with BS EN 50470-1 Section 5.9 is IP51 with a Device fitted.

The definition of IP ratings is found in BS EN 60529.

B1.6 Physical security

B1.6.1 Sealing screw – Device to Host

The Device shall be secured to the Host by a typical metering sealing screw, which shall engage a threaded metal insert in the Host and be positioned on the centre-line of the interface. Only the dimensions of the female threaded portion are defined in B1.2, as other aspects of the sealing screw are allowed to vary.

B1.6.2 Sealing Screw – Device

The Device sealing screw itself is not defined in this ICHI Specification, but shall be selected to ensure that it is suitable for use with the female thread and associated recess defined in B1.2; in particular, the minimum length. To ensure reliable engagement and avoid any possible interference the end of the screw should be between 25.0mm and 30.0mm from the datum plane (placing the minimum at 8mm engagement past maximum depth of the threaded Host insert from datum plane). Device manufacturers should also ensure that the sealing screw selected can be used if the threaded Host insert is not placed at the maximum permitted depth.

B1.7 Interface mechanical performance

The implementation of the mechanical interface of the Device, or Host, shall at least comply with, or being able to handle, the following parameter values:

- Max Device weight <= 2Kg
- Pull off force of screw > 800N
- Maximum force withstand on any face of the Device except rear face (wall side) 100N
- Torque limit for sealing screw < 2Nm
- Insertion force < 45N
- Removal force < 45N

B1.8 General mechanical and environmental requirements for Hosts and Devices

All Hosts and Devices shall comply with the following sections of the metering standard BS EN 50470-1 where the word ‘meter’ in the standard is replaced as appropriate by:

- Hot Shoe;
- Cradle;
- Adaptor;
- Blanking Plate; or
- Communications Hub.

5.1 – General Mechanical Requirements

5.2 – Case

  5.2.1 – Requirements

  5.2.2 – Mechanical tests

    5.2.2.1 – Spring hammer test

    5.2.2.2 – Shock test

5.2.2.3 – Vibration test

5.5 – Terminal Cover

5.6 – Clearance and creepage distances

5.7 – Insulating encased meter of protective class II

5.8 – Resistance to heat and fire

5.9 – Protection against penetration of dust and water (for indoor use)

5.13 – Accompanying information

6.1 – Temperature ranges

6.2 – Relative humidity

6.3 – Test of the effect of the climatic environments

6.3.1 – Dry heat test

6.3.2 – Cold test

6.3.3 – Damp heat cyclic test

B2.0 Specific requirements for mechanical interface

B2.1 Specific requirements for Communications Hubs

A Communications Hub shall comply with ~~section~~ Part B1.8 where ‘Communications Hub’ shall replace the word ‘meter’ in the standard as appropriate.

B2.2 Specific requirements for single phase ESMEs

There are no specific requirements for single phase ESMEs. All general requirements apply.

B2.3 Specific requirements for twin element ESMEs

There are no specific requirements for 5 terminal or twin element ESMEs. Note, however, that if the ESME is wider than a standard single phase ESMEs ~~as defined in BS EN 7856~~, the ESME manufacturer should ensure that water is not able to gather on the exposed surfaces.

B2.4 Specific requirements for polyphase ESMEs

There are no specific requirements for polyphase ESMEs. Note, however, that if the ESME is wider than a standard single phase ESME ~~as defined in BS EN 7856~~, the ESME manufacturer should ensure that water is not able to gather on the exposed surfaces.

B2.5 Specific requirements for Hot Shoes

A Hot Shoe shall comply with ~~section~~ Part B1.8 where ‘hot shoe’ shall replace the word ‘meter’ in the standard as appropriate.

B2.6 Specific requirements for Blanking Plates

A Blanking Plate shall comply with ~~section~~ Part B1.8 where ‘blanking plate’ shall replace the word ‘meter’ in the standard as appropriate.

B2.7 Specific requirements for Cradles

A Cradle shall comply with ~~section~~ Part B1.8 where ‘cradle’ shall replace the word ‘meter’ in the standard as appropriate.

B2.8 Specific requirements for Adaptors

An Adaptor shall comply with ~~section~~ Part B1.8 where ‘adaptor’ shall replace the word ‘meter’ in the standard as appropriate.

B3.0 Optional Features and Information

B3.1 Optional AC signalling connector

B3.1.1 AC Connector details for Devices

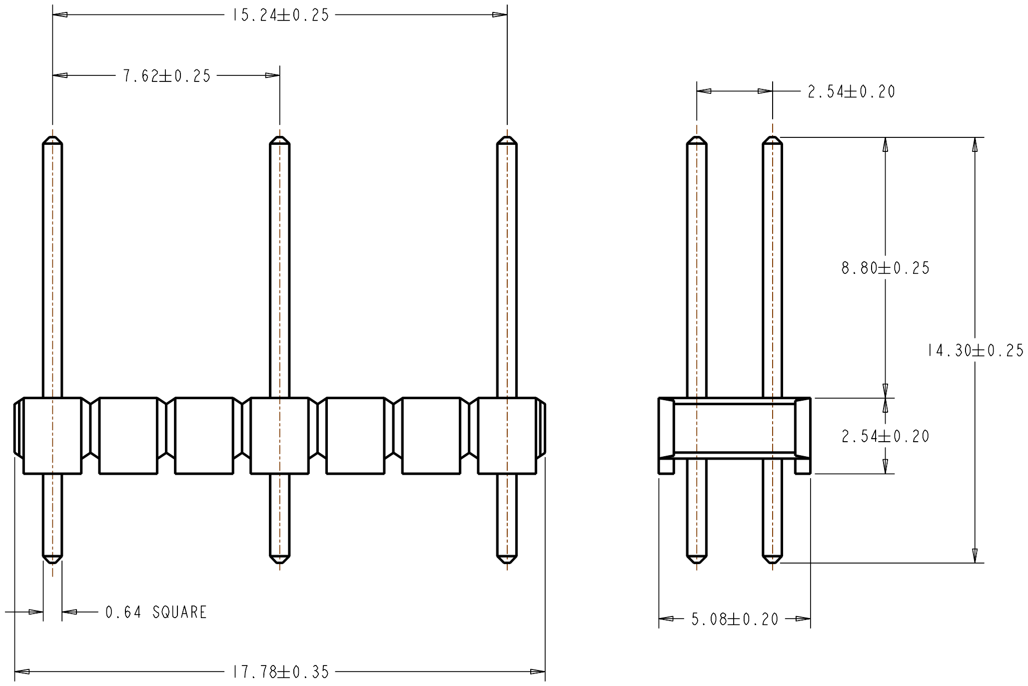


Figure B3.1-1 Connector Diagram

Figure B3.1-1 shows an example of the AC mains connector on the CH. This connector is formed from a 2x7 DIL header (IEC-C207MS-S1 or IEC-C207MR-S1 as defined in BS EN 60603-8), with the exception that specific fixed contacts are not populated. Pins are present only in columns 1, 4 and 7.

B3.1.1.1 Standards applicable to the male connector

The connector shall conform to BS EN 60603-8 style "C" in all respects other than the fixed contact length, which shall be increased to 8.8mm as shown in the drawing above. This increased length is to allow for mouldings between the male and female headers.

B3.1.2 AC Connector details for Hosts

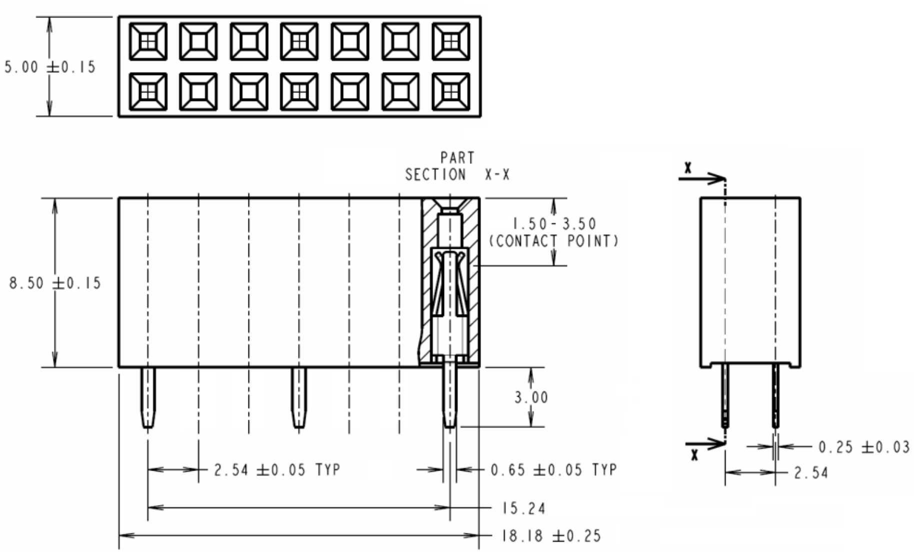


Figure B3.1-2 Socket Diagram

Figure B3.1-2 shows the AC mains connector fitted to a Host. It is formed from a 2x7 DIL connector (IEC-C207FS-S1 as defined in BS EN 60603-8) with the exception that specific fixed contacts do not need to be populated. Contacts are only required to be present in columns 1, 4 and 7; other contacts may be populated as long as this does not compromise electrical safety, particularly around creepage and clearance requirements. Hosts shall be able to accept a connection from a Device with all permitted Device positions populated. This may be achieved with a connector with voids in the moulding.

B3.1.2.1 Standards applicable to the female connector

The connectors conform to BS EN 60603-8 style “C”.

B3.2 For information only

B3.2.1 Details of CH mechanical dimensions

- Height:
  - The height of the Hosts and Devices are out of scope of this document.
- Width:
  - The widths of Hosts are out of scope of this document. The outer dimensions are for specification by the relevant Host manufacturer providing the whole of the mating mechanism is accommodated.
  - The Device should be at least as wide as the nominal single phase ESME width (130mm) to ensure there is no lip left at the top of the Host. If the Host is wider, the Host manufacturer shall ensure that water does not accumulate in order to ensure that the interface maintains IP53 rating.

- Depth of the CH towards the back face:
  - To avoid the CH fouling on the wall to which a minimum depth ESME has been mounted, the theoretical maximum depth of the CH (from the datum plane) is 47.3 mm.
  - The Host manufacturer shall ensure that water does not collect behind the interface if the CH does not extend the full 47.3mm behind the datum, or if the Host places the datum more than 47.3mm in front of the back face.
- Depth of CH towards the front of the Host:
  - The depths of Hosts and Devices are out of scope of this document. The outer dimensions are for specification by the relevant manufacturer providing the whole of the mating mechanism is accommodated.
  - The Communications Hub design should place the front face at least 17.7 mm from the datum plane.
  - The Host manufacturer shall ensure that water does not collect in front of the interface if the Host places the datum more than 17.7mm behind the front face.

Figure B3.2-1 shows some possible CH shapes – these are examples and should not be taken as guides.

Figure B3.2-1 Possible shapes for the CH – for guidance only

B3.3 Requirement for Communication Hub

The AC connection pin are forbidden on the Communication Hub.

Part C DC Power

C1.0 Requirements for Provision of DC Power

C1.1 Details of the mechanical DC connector

Details of the connector are given in B1.4.

The connection details are given in the table below:

Pin Number	Function	Pin Number	Function
1	DC - +12V	2	DC - +12V
3	DC - Common	4	DC - Common

Full details of the connector, including diagrams and the purpose of all other pins, are given in Part E.

C1.2 DC power management

The power supply pins shall be connected to a single supply from the Host – ideally by connecting pins 1 to 2 and 3 to 4 directly at the connector block.

It is not mandatory for the DC power supply to be isolated in the Host. The Host manufacturer may choose for it to be referenced to the phase conductor (which shall be likely in ESMEs using a resistive shunt for current measurement), or to the mains neutral conductor. Therefore, the Device design shall include appropriate insulation or isolation if it includes any exposed parts.

Data Communications Company

C1.2.1 Mandatory Characteristics

Note: The values specified here are those at the connector of the Communications Hub Interface. If the ICH is mounted directly to an ESME or a Hot Shoe, this should be identical to what is produced by the ESME or Hot Shoe. If the ICH is mounted to a Cradle, powered via a flying lead and Adaptor, the installer shall verify that the quality of the DC power supply at the Cradle meets these specifications.

Parameter[1]	Symbol	Value	Unit	Tolerance	Description
Voltage	V_{DC}	12	V	+/-25%	This specifies the limits of the DC voltage from the interface, provided not more than W_{max} is being drawn. The DC voltage from the interface may be at any value between these limits; the nominal value should not be taken as typical.
Ripple	V_{ripple}	400	mVpp	Maximum	This specifies the maximum ripple at frequencies up to 150kHz.
~~Noise~~	~~V_{noise}~~				~~See section Part A1.1C1.3.~~
Power	W_{max}	6	W	Minimum	This is the minimum power guaranteed to be made available to the Device by the interface during normal supply conditions[2]. Hence, this is the maximum power which the Device is entitled to draw, except as specified under Cut-off delay.
Cut-off delay	t_{OV}	30	ms	Minimum	If the Device attempts to draw more power than W_{max}, the Host is entitled to reduce the voltage as far as needed to limit the power to W_{max} or to limit the current to a value equivalent to W_{max}/V_{DC}. For the avoidance of doubt, the quantity for V_{DC} in the above function is the nominal value defined under V_{DC} earlier in this table.

[1] The values specified here are those at the connector of the Communications Hub Interface. If the ICH is mounted directly to an ESME or a Hot Shoe, this should be identical to what is produced by the ESME or Hot Shoe. If the ICH is mounted to a Cradle, powered via a flying lead and Adaptor, the installer shall verify that the quality of the DC power supply at the Cradle meets these specifications.

[2] See under Mains Power Failure for behaviour during mains power loss and restoration, and abnormal mains supply conditions.

Parameter[1]	Symbol	Value	Unit	Tolerance	Description
					As defined above, the limiter characteristic in the Host shall approximate to a power-limit function or to a current-limit function, or to a blend of the two characteristics. If the load condition causing the Host to enter this power-limit state persists for longer than time t_{OV}, the Host is entitled to cut off the DC voltage supply. The purpose of the cut-off delay is to allow for the presence of uncharged capacitance at the supply input to the Device under "hot swap" conditions, up to 220uF (nominal). If ultra-caps or similar high-capacitance energy storage is used in the Device in support of "last gasp" or similar features, the charging of these capacitances shall be managed by the Device. Note: Once the limiting function of the Host has been triggered, in order to guarantee exit of the DC Voltage supply from the limiting state, and without entering cut-off, the Device would need to reduce both its load current below W_{max}/V_{DC} and its input power below W_{max}. This process can be automatic, without elaborate design precautions in the Device. The input capacitance of the Device shall charge to the target V_{DC} value, and the Device shall then start up. It is recommended that the Device does not start up until the DC voltage supply at the input to the Device has stabilised within the range specified under V_{DC}. **Note:** The Host is not obliged to limit the power drawn to W_{max}, or to cut off the DC Voltage supply at time t_{OV} under this load condition, except as specified under Guaranteed cut-off. **Warning:** Cut-off of the DC voltage supply is regarded as a fault condition in the Device, and designers of Devices should not attempt to use the assumed cut-off characteristic of the Host as part of a power management strategy. The cut-off characteristic of the DC voltage may vary considerably from one model of Host to another within the bounds of this specification.

Parameter[1]	Symbol	Value	Unit	Tolerance	Description
					The Host may log instances of cut-off and this log may be used to determine a need to swap out the Device.
Re-try timer	t_{RT}	10-40 x t_{OV} min	ms		If the Host cuts off the DC voltage supply as described under cut-off delay or guaranteed cut-off, the Host shall re-connect the supply after t_{RT}. If the load which caused cut-off is still present, the Host shall cycle through the cut-off delay process or guaranteed cut-off process as described under the respective headings.
Guaranteed cut-off level	W_{cutoff}	2 x W_{max}	W	Maximum	If the Device draws more than W_{cutoff}, the Host shall cut off the DC Voltage supply within time t_{GC}. Note that the Host is not obliged to supply more than W_{max}, but if it does, it is obliged to not supply more than W_{cutoff} for longer than t_{GC}.
Guaranteed cut-off timer	t_{GC}	45	ms	Maximum	See under Guaranteed cut-off level.
Cut-off leakage current	I_{co}	1	mA	Maximum	In the cut off state, the leakage current from the Host into the load of the Device shall not exceed I_{co}. The purpose of specifying a maximum value for this parameter is to enable the designers of Devices to ensure that the Device shall be fully reset by the cut-off action of the Host.
Mains supply failure: Hold-up time	t_{HU}	0	ms	Minimum	The DC voltage supply is not intended to provide a “hold-up” function to the Device. The characteristics defined variously above for the DC voltage supply apply while the mains supply to the Host is between the minimum and maximum

Parameter[1]	Symbol	Value	Unit	Tolerance	Description
					operating voltages specified for the Host to support the DC Voltage supply to the Device.[3] If the supply at any time falls below the minimum operating voltage defined for the Host for support of DC Voltage to Device, the Host is entitled to cut off the DC Voltage supply without warning. This may apply to a short break in the mains, during which an ESME maintains metering function. Warning: If the Device has a need for a “hold-up” function, whereby an early warning is given of Host power failure, this shall be provided internally to the Device.
Mains supply failure: Restoration delay	t_{PU}	5	s	Maximum	When the mains supply to the Host rises above the minimum operating voltage specified for support for DC voltage supply to Device, the Host shall restore the DC Voltage supply without a delay of more than t_{PU}. During restoration of the DC voltage supply, the voltage may fall outside the limits specified under V_{DC}, except that the voltage shall never exceed the maximum value specified under V_{DC}.

[3] If the minimum and maximum operating voltages specified for the ESME are wider than the minimum regulatory requirements, the supplier of the ESME may choose to apply the minimum regulatory requirements for support of DC Voltage to the CH.

EMC requirements on DC power supply

C1.3 EMC requirements on DC Power supply

Section not used

The DC power supply of the Host is intended for use with CHs that have the immunity to RF common mode noise on their DC power ports as specified in the following sub-section.

C1.3.1 Common mode noise restrictions

The common mode noise present on the DC power supply output from the Host, including that due to switched mode power supplies in the Host, shall be no more than that permitted in IEC EN 62684 Section 5.4 "DC Output Characteristics"[4]:

Parameter	Value
Peak to peak voltage measured in the frequency range of 1 kHz to 100 kHz	<1000 mVpp
Peak to peak voltage measured in the frequency range of 100 kHz to 400 kHz	<200 mVpp
Peak to peak voltage measured in the frequency range of 400 kHz to 1 MHz	<39 mVpp
Peak to peak voltage measured in the frequency range of 1 MHz to 100 MHz	<20 mVpp
Occupied bandwidth of the fundamental measured with peak hold	<+/- 10% of the EPS switching frequency
Slew Rate	Maximum amount of slew within any 100ns window is 1250 mVpp

For conducted noise at other frequencies, Devices shall have the level of immunity to RF common mode noise on their DC power ports that is required in section 9.5 of ETSI EN 301 489-1 for radio equipment that may be used with cable longer than 3m."[5]

[4] Test methods referenced are in Section 6.2 "Common mode voltage of the DC output".

[5] The tests specified in section 9.5 of ETSI EN 301 489-1 would normally only be applied at the DC power input to the radio equipment where the connection between power supply and radio equipment was not intimate (i.e. not directly connected, and connected through a cable over three metres long). In other cases, the test would be performed by applying noise to the AC input side the of the external AC/DC power supply.

~~C1.4~~C1.3 DC Safety Considerations – Intimate Connection

DC power supply isolation from mains conductors in the Host is not mandatory. As a result, the DC power supply may be referenced to live or neutral. It is the responsibility of the Host manufacturer to ensure safe operation of the Host.

The Device manufacturer needs to ensure appropriate protection in the Device against fault conditions; the Host shall remain safe if a fault occurs in the flying lead or CH that results in a low impedance connection to ground or mains neutral.

For an Installation to be considered safe, as well as conforming to the relevant safety standards, when tested for the effects of short circuit and overload currents at least the following statements should be true:

- Any material or hot gas that is ejected by the Host and Device assembly shall not cause fire.
- Insulation between mains circuits and accessible conducting parts, including low-voltage auxiliary circuits shall remain intact. The ESME/Host shall pass the insulation tests given in BS EN 50470-1, Section 7.3.3 and 7.3.4 after a fault event.

Any fuse incorporated in the Host is not intended to provide protection against electrical shock and shall not be represented as such. The risk remains equivalent to accessing the main ESME terminals.

The design of a Device shall not be based on any assumption that the Host contains additional impedances which would limit the prospective short circuit current values at the mains input of the Device. Hosts compliant with this ICHI Specification are not required to include short-circuit current limiting impedances between their main terminals and the live AC connections, including phase referenced DC connections made available in the interface.

The specification for the mechanical design of the interface ensures that the contacts become inaccessible before the male and female parts make electrical contact.

~~C1.5~~C1.4 DC Safety Consideration – External Metal – Device

As the DC power supply from the Host may not be isolated from the AC mains, any external metal on the Device (including a connector for an external antenna) shall be isolated from the DC power supply within the Device.

C2.0 Specific requirements for the provision of DC power

C2.1 Specific requirements for Communications Hubs

A Communications Hub shall comply with the following tests, aligned with the comparable tests required of ESMEs:

C2.1.1 Insulation

The Device shall retain adequate dielectric qualities under normal conditions of use, taking into account the effects of the climatic environment and different voltages to which it is subjected under normal conditions of use.

When coupled with a separate Host which has already passed the impulse voltage test and the AC voltage test as specified in BS EN 50470-1~~:2006~~, Section 7.3.1 to 7.3.3, the combination shall remain compliant with the tests below. For the avoidance of doubt, not every combination of CH and Host needs to be tested, however each CH and Host manufacturer must be able to demonstrate compliance.

C2.1.1.1 General test conditions

The tests shall be carried out only on a complete Installation with all covers fitted (except when indicated hereinafter) and terminal cover, the terminal screws being screwed down to the maximum applicable conductor fitted in the terminals.

Test procedure in accordance with ~~IEC~~ BS EN 60060-1.

The impulse voltage tests shall be carried out first and the AC voltage tests afterwards.

During type tests, the dielectric strength tests are considered to be valid only for the terminal arrangement of the ESME which has undergone the tests. When the terminal arrangements differ, all the dielectric strength tests shall be carried out for each arrangement.

For the purpose of these tests, the term ‘earth’ is a conductive foil wrapped around the Installation touching all accessible conductive parts and connected to the flat conducting surface on which the ESME base is placed. Where the terminal cover makes it possible, the conductive foil shall approach the terminals and the holes for the conductors within a distance of not more than 2 cm.

During the impulse and the AC voltage tests, the circuits which are not under test are connected to the earth as indicated hereinafter.

After these tests, there shall be no mechanical damage to the Host or Device.

These tests shall be made in normal conditions of use. During the test, the quality of the insulation shall not be impaired by dust or abnormal humidity.

Unless otherwise specified, the normal conditions for insulation tests are:

- ambient temperature: 15 °C to 25 °C;
- relative humidity: 45 % to 75 %;
- atmospheric pressure: 86 kPa to 106 kPa.

If for any reason the insulation tests have to be repeated, then they may be performed on a new specimen.

C2.1.1.2 Impulse Voltage Test

The test shall be carried out under the following conditions:

- impulse waveform: 1.2/50 impulse specified in ~~IEC~~ BS EN 60060-1;
- voltage rise time: ±30 %;
- voltage fall time: ±20 %;
- source impedance: 500 Ω ± 50 Ω;
- source energy: 0.5 J ± 0.05 J;

- test voltage: 4000V;
- test voltage tolerance: +0 – 10 %.

For each test, the impulse voltage is applied ten times with one polarity and then repeated with the other polarity. The minimum time between the impulses shall be 3 seconds.

C2.2 Specific requirements for single phase ESMEs

The DC power shall be derived from the unmetered side of the ESME before any measurement element. The DC power supplied by the ESME shall be the same as specified in C1.2.

C2.3 Specific requirements for single phase, twin element ESMEs

The DC power shall be derived from the unmetered side of the main circuit in the ESME before any measurement element. The DC power supplied by the ESME shall be the same as specified in C1.2.

C2.4 Specific requirements for polyphase ESMEs

The DC power shall be derived from the unmetered side of the ESME before any of the measurement elements. The DC power supplied by the ESME shall be the same as specified in C1.2.

The DC power shall continue to be supplied from the ESME in case of any loss of phase as per BS EN 50470-3 – Table 9 Note (a).

C2.5 Specific requirements for Hot Shoes

The DC power supplied by the Hot Shoe shall be the same as specified in C1.2.

C2.6 Specific requirements for Adaptors and Cradles

The DC interface of the ESME may be used to provide DC power for a remote CH via an Adaptor, flying lead and Cradle. The protection of the flying lead and the CH shall be the responsibility of the manufacturer of the Adaptor, flying lead and Cradle.

The DC power supplied by the Cradle shall be the same as specified in C1.2. It shall be up to the manufacturer to ensure compatible ESMEs and / or CH provide adequate margin on DC voltage to compensate for any voltage drop across the Adaptor, flying lead and Cradle.

The connection methodology for the flying lead shall not compromise any of the electrical or safety considerations of the ESME and CH interfaces prescribed under this Part C.

DC power supply isolation from mains conductors is not mandatory. As a result, the DC power supply may be referenced to live or neutral. It is the responsibility of the Adaptor, flying lead and Cradle manufacturer to ensure safe operation of the Installation.

The Adaptor shall provide overcurrent and fault current protection for all the conductors in the cable, including the “DC-Common” and “DC - +12V” lines. This protection shall address the case of damage to the cable, or where an attempt was made to extract un-metered energy from the end of the flying lead remote from the ESME.

The Adaptor shall be fitted with appropriate fuse(s).

The insulation system provided in the cable of the flying lead shall provide adequate functional and safety insulation commensurate with the conductors of the flying lead being connected to the mains network very close to the point of entry of the mains supply into the building (before the consumer distribution unit). The strength of the insulation shall be adequate for the expected phase to ground over-voltages at this point. Installation of the flying lead shall conform to BS7671:2018 and ~~BS7540~~BS EN 50565-1:2014.

There must be no expectation that the ESME shall provide any attenuation or clamping of phase to ground over-voltages.

A Cradle or Hot Shoe shall comply with the EMC requirements set out in BS EN 61204-3:~~2001~~ and all other tests specified in C2.1.1.2.

C3.0 Other DC Power Considerations (For information only)

C3.1 Considerations for fusing L_{supply}, L_{load}, and DC connections

Any fuse provided in the Host or Device shall coordinate with the service cut-out fuse and shall create an open circuit ("blow") first under all circumstances. This is not seen to be an issue where the cut-out fuse is rated at 60A, 80A or 100A, but would need to be given careful consideration if very low value (5A, 10A) cut-out fuses were ever used.

The rating of the fuse shall be able to cope with 10kA maximum prospective fault currents.

The ESME cannot be assumed to include any fusing or other protection on its outputs, but individual ESME manufacturers may design-in additional levels of protection as best practice or as acceptable to procuring energy suppliers.

This specification advises CH suppliers that the DC power supply output of the ICHI from the Host may not necessarily be isolated from the mains supply in all circumstances. The DC-Common connectors may be directly connected, through low impedance circuits, to the L_{supply} terminal of the Host. Alternatively, it may be connected to the Neutral of the mains, or it may be floating.

If the DC-common is connected to L_{supply}, then it follows that there shall be galvanic connections between the DC - +12V connections and L_{supply}.

The specification for the DC power supply output of the ESME (~~section~~ Part C1.2) includes the requirement for protection against overcurrent and short circuits between the "DC-Common" and "DC - +12V" connector pins. That specification does not address the risks of fault currents flowing from the "DC-Common" and or "DC - +12V" connections and mains live or protective earth conductors.

Suppliers of CH shall ensure that the Devices provide adequate protection against contact with the potentially live internal circuits. This shall be true even if the ICH only connects to the DC power supply output from the ESME.

Where the CH is to be mounted remotely from the ESME and connected by a flying lead linking an ESME-mounted Adaptor and a Cradle, the Adaptor shall provide overcurrent and fault current protection for all the conductors in the flying lead, including the "DC-Common" and "DC - +12V" lines. This protection shall address the case of damage to the flying lead, or where an attempt was made to extract un-metered energy from the end of the flying lead remote from the ESME.

C3.2 Power Supply References

The DC power supply may be referenced to live or neutral dependent on the Host design. To be interoperable, an ICH shall function safely and correctly regardless of whether it is installed onto a Host with live reference or neutral referenced DC power supply output.

Part D ~~Optional AC Signalling Provision~~Section Not Used

~~D1.1 Introduction~~ ~~Purpose~~

~~Section removed~~

~~Where provided, the purpose of the AC signalling connections is not to provide AC power for a Communications Hub, as it is required that the Communications Hub will derive power from the mandatory DC connector. If AC signals are present on an interface variant, the CH shall not use them to derive its power supply.~~

~~Connections to the AC supply could be used to couple PLC signals onto the incoming and/or outgoing mains connectors.~~

~~The incoming connection to L_{supply} could be used for messages on a wired PLC WAN at all times, and on a wired PLC HAN when the premise's load relay is connected (closed).~~

~~The outgoing connection L_{load} could be used for messages on a wired PLC HAN when the premise's load relay is disconnected (open). This could be used, for example with (battery powered) PPMID devices to add credit to a disconnected prepayment ESME.~~

~~D1.2 Conditions for use of AC signalling~~

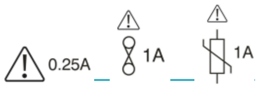
~~The provision of the connector for AC signalling is not a mandatory part of ICHIS.~~

~~A Host which does provide the AC Signalling connector shall provide one of the following connection options where the pin definitions are provided in D2.1:~~

- ~~L_{supply} and N – N_{supply} and L_{load}~~
- ~~L_{supply} and N – N_{supply} only~~
- ~~N – N_{supply} and L_{load} only~~

~~The signals provided by the Host shall be clearly marked near the connector, and clearly identifiable.~~

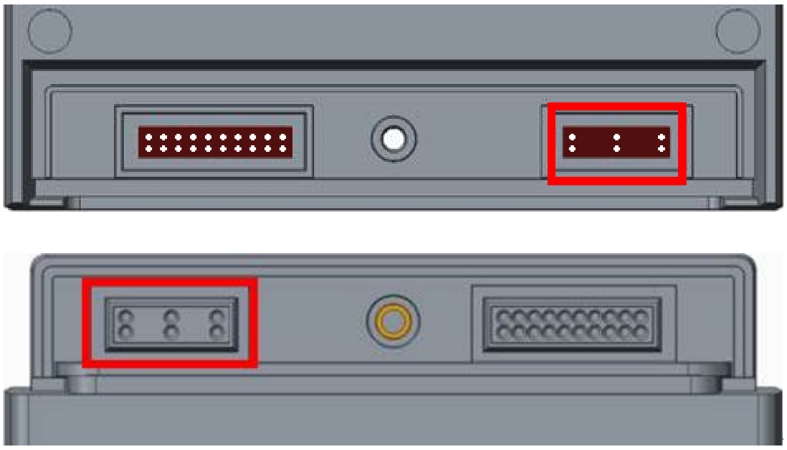
~~The Host shall be marked with appropriate symbols indicating the supported signals and the type and limits of fusing which protects the connector, for example:~~



~~**Figure D1.2-1 Examples of fusing symbols**~~

D2.0 Requirements for the provision of AC Signalling

D2.1 Connector Details



View of connectors on rear of Device

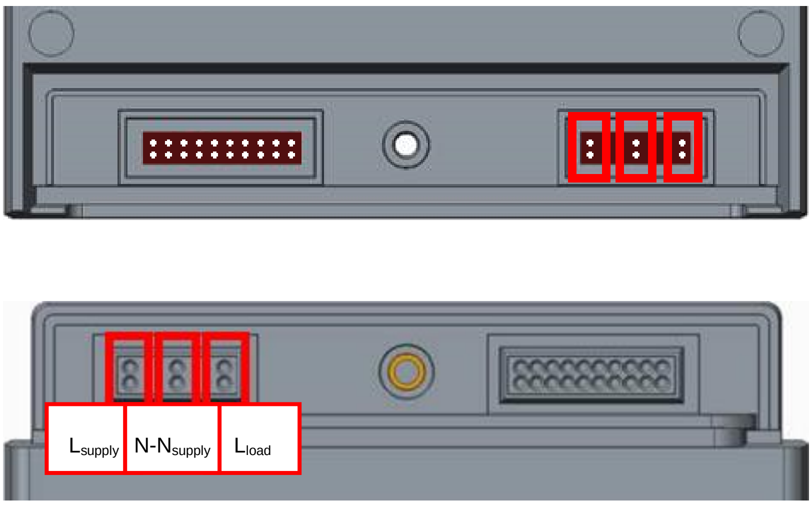
View of connectors on front of Host

Figure D2.1-1 physical arrangement for the AC connector

This connector provides:

- L_{supply} – 230V – direct from the unmetered live supply connection terminal
- N – N_{supply} – directly from the neutral connection terminal. Where the ESME includes means for sensing the mains neutral current, this connection would again be taken from the “unmetered” neutral supply.
- L_{load} – Directly to the live load main connection of the ESME for the use of PLC HAN when a site is disconnected

Two pins are used for each of these three connections, as shown in Figure D2.1-2:



View of connections on rear of Device

View of connections on front of Host

Figure D2.1-2 Connector Locations

The male connector shall be on the Device.

The female connector shall be on the Host.

The spacing between pins complies with appropriate creepage and clearance standards. Refer to D2.2 below on appropriate safety standards.

L_{load} allows for a CH incorporating PLC HAN without the need to bypass the contactor when the switch is open.

D2.2 Safety Requirements

For an Installation to be considered safe, as well as conforming to the relevant safety standards, when tested for the effects of short circuit and overload currents at least the following statements should be true:

- Any material or hot gas that is ejected by the Host and Device assembly shall not cause fire.
- Insulation between mains circuits and accessible conducting parts, including low-voltage auxiliary circuits shall remain intact. The ESME/Host shall pass the insulation tests given in BS EN 50470-1:2006, Section 7.3.3 and 7.3.4 after a fault event.

Note: Any fuse incorporated in the ESME is not intended to provide protection against electrical shock. The risk remains equivalent to accessing the main ESME terminals.

The manufacturer of a Host may choose to fit a fuse(s) as part of the fail-safe implementation to any or all of the live AC connections to the ICH. In such cases, the fuse type and rating shall be marked near the connection, and the fusing mechanism shall not impede any existing narrowband or broadband PLC technologies. For example:

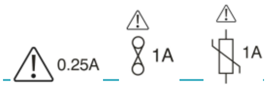


Figure D2.2-1 Examples of fusing symbols

The design of an ICH shall not be based on any assumption that the ESME contains additional impedances which would limit the prospective short circuit current values at the mains input of the CH. ESMEs compliant with this ICHIS are not required to include short-circuit current limiting impedances between their main terminals and the live AC connections made available in the interface.

The specification for the mechanical design of the Host and Device interface ensures that the contacts become “inaccessible” before the male and female parts make electrical contact.

If a flying lead is used between an Adaptor and Cradle, the safety requirements in section C3.0 shall be respected.

D2.3 PLC Coupling requirements

If a current of greater than 0.25A is drawn from this supply, there may be a permanent failure of the AC connection inside the Host. In this event, the Host shall remain safe. Where a downstream fuse is provided in the Device, the rating of that fuse shall be coordinated with the rating of the output of the ICHI. A typical rating of the fuse in the CH would be less than 70% of the ICHI rating i.e. <70% of 0.25A.

The AC signalling pins may pass through some protective circuitry in the Host. In this case, there shall be no attenuation of signals in the:

- Narrowband PLC frequency range: 9kHz – 500kHz
- Broadband over PowerLine frequency range: 1.6MHz – 80MHz

D3.0 Specific requirements for AC Signalling Connections

D3.1 Specific requirements for Communications Hubs

The AC connection pins are not mandatory on a Communications Hub. However, if fitted they shall comply with all of the requirements in Part D and Part B3.1.1

D3.2 Specific requirements for Blanking Plates

A Blanking Plate shall not provide the AC Signalling pins.

D3.3 Specific requirements for single phase ESMEs

The AC connection socket is not mandatory on a single phase ESME. However, if fitted it shall comply with all of the requirements in Part D and Part B3.1.2. Notably, it shall accept pins of a corresponding Device physically fitting onto the ESME.

D3.4 Specific requirements for twin element ESMEs

The AC connection socket is not mandatory on a twin element ESME. However, if fitted it shall comply with all of the requirements in Part D and Part B3.1.2. Notably, it shall accept pins of a corresponding Device physically fitting onto the ESME.

If fitted, the L_{load} connection shall be connected to the main output of the ESME, to the primary disconnect switch.

D3.5 Specific requirements for polyphase ESMEs

The AC connection socket is not mandatory on a polyphase ESME. However, if fitted it shall comply with all of the requirements in Part D and Part B3.1.2. Notably, it shall accept pins of a corresponding Device physically fitting onto the ESME.

If fitted, the L_{supply} connection and L_{load} shall be connected to L_1 of the ESME.

D3.6 Specific requirements for Hot Shoes

The AC connection socket is not mandatory on a Hot Shoe. However, if fitted it shall comply with all of the requirements in Part D and Part B3.1.2. Notably, it shall accept pins of a corresponding Device physically fitting onto the Hot Shoe.

A Hot Shoe may provide only the corresponding connections for L_{supply} and N-N_{supply}, in which case it would not provide PLC HAN connections (when the ESME is in a disconnect state).

D3.7 Specific requirements for Cradles

The AC connection socket is not mandatory on a Cradle. However, if fitted it shall comply with all of the requirements in Part D and Part B3.1.2. Notably, it shall not impede any pins of a corresponding CH physically fitting onto the ESME.

A Cradle may provide any of the combinations of connections referenced in D1.2.

D3.8 Specific requirements for Adaptors

The AC Signalling pins for the ICH in the ESME may be used to provide AC mains for a Cradle via an Adaptor with a flying lead. The protection of the flying lead and the Cradle shall be the responsibility of the manufacturer of the Adaptor. The Adaptor shall be fitted with an appropriate fuse.

The insulation system provided in the cable of the flying lead shall provide adequate functional and safety insulation commensurate with the conductors of the cable being connected to the mains network very close to the point of entry of the mains supply into the building (before the consumer distribution unit). The strength of the insulation will be adequate for the expected phase to neutral over-voltages at this point, and for the expected phase to ground over-voltages. There must be no expectation that the ESME will provide any attenuation or clamping of phase to neutral over-voltages. The ESME will not have any electrical connection to ground, so again it is not able to provide any attenuation or clamping of phase to ground over-voltages. It is the responsibility of the Adaptor, flying lead and Cradle manufacturer to ensure safe operation of the Installation.

Shielding of the flying lead should also be considered in order to maintain the EMC requirements of the power supply.

The conductors provided in the flying lead cable shall have adequate cross section to prevent excessive voltage drops or heating when the cable is carrying the rated 50Hz current drawn by the CH. The total impedance of the assembly – including that of the in-line protective devices (such as fuses), the phase conductor, and the neutral conductor – shall not exceed 10 ohms when measured at 23°C and 50Hz.

Part E Digital Signalling Pins

E1.0 Introduction

E1.1 Purpose

There are 16 digital signalling pins on the same connector as the mandatory DC power supply pins.

These hardwired pins are (or can be) used for interaction between the Host and the Device.

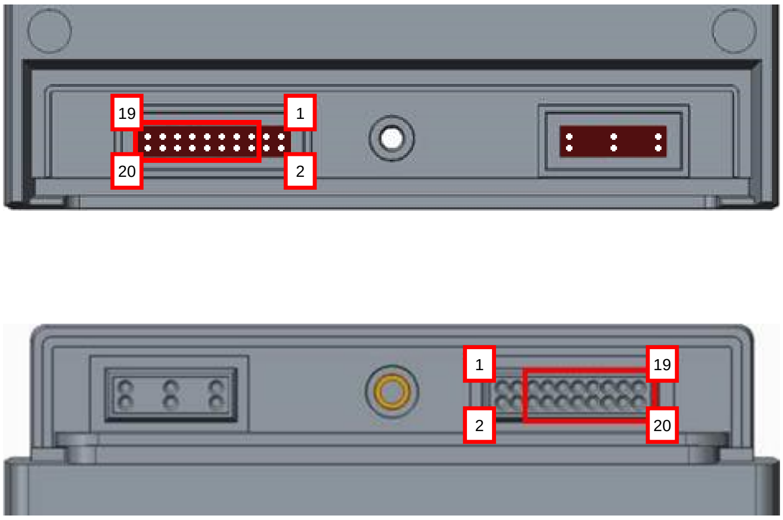


Figure E1.1-1 Digital Signalling Pins

E1.2 Pin Positioning

1 12V	3 Com- mon	5 CH_ PR	7 TX_ MT	9 AC_ LO	11 CSP_ B	13 RMM_ B	15 RMM_ D	17 RMM_ F	19 CSP_ E
2 12V	4 Com- mon	6 MT_ PR	8 RX_ MT	10 CSP_ A	12 CSP_ C	14 RMM_ C	16 RMM_ E	18 CSP_ D	20 CSF_ F

Data Communications Company

E1.3 Specific Requirements for Host and HubsPin Definitions

2x3	7x2	10x2	Connector size				
Pin No.			Name	Symbol	I/O[6]	Pull-up[7, 8]	Function
1	1	1	+12V	+12V	-	-	12V DC power supply rail
2	2	2	+12V	+12V	-	-	12V DC power supply rail
3	3	3	Common	COM	-	-	Common DC power supply rail
4	4	4	Common	COM	-	-	Common DC power supply rail
5	5	5	Device Present	CH_PR	Input	Y	Active low (Communications Hub present)
6	6	6	Host Present	MT_PR	Output	Y	Active low (Host Present)
-	7	7	Transmit Data (Tx)	TX_MT	Output	Y	Serial NRZ line code, logic 0 = high
-	8	8	Receive Data (Rx)	RX_MT	Input	Y	Serial NRZ line code, logic 0 = high
-	9	9	AC Lost	AC_LO	Output	Y	Active high (no AC present)
-	10	10	Reserved	CSP_A	NC	N	For use by CSP
-	11	11	Reserved	CSP_B	NC	N	For use by CSP
-	12	12	Reserved	CSP_C	NC	N	For use by CSP
-	13	13	Reserved	RMM_B	NC	N	For future use by ESME manufacturer
-	14	14	Reserved	RMM_C	NC	N	For future use by ESME manufacturer
-	-	15	Reserved	RMM_D	NC	N	For future use by ESME manufacturer
-	-	16	Reserved	RMM_E	NC	N	For future use by ESME manufacturer
-	-	17	Reserved	RMM_F	NC	N	For future use by ESME manufacturer
-	-	18	Reserved	CSP_D	NC	N	For use by CSP
-	-	19	Reserved	CSP_E	NC	N	For use by CSP
-	-	20	Reserved	CSP_F	NC	N	For use by CSP

[6] Inputs and outputs are defined from the perspective of the Host

[7] Pull-up resistors are required on specified data lines within the Communications Hub, with the exception of RX_MT, in which it is fitted internal to the ESME.

[8] Data lines are open-collector / open-drain with a maximum of 5V output

Connector Size								Connection on Device[10]					
Pin No.			Name	Symbol	I/O[6]	Pull up	Function	ESME	CH	Blanking	Hot	Adapter	Notes
2x3	7x2	10x2											
1	1	1	+12V	+12V	-	-	12VDC power supply rail	M	M	F	M	M	From host to power CH
2	2	2	+12V	+12V	-	-	12VDC power supply rail	M	M	F-	M	M	From host to power CH
3	3	3	Common	COM	-	-	Common DC power supply rail	M	M	M	M	M	
4	4	4	Common	COM	-	-	Common DC power supply rail	M	M	-F	M	M	
5	5	5	Device Present	CH_PR	Input	Y	Active low (CH present)	M	M	M	M	M9	Generated internally by Blanking Plate/CH. Maximum 10Ω link to COM. For Adaptors this signal shall not be carried over a flying lead to a Cradle
6	6	6	Host Present	MT_PR	Output	Y	Active low (Host Present)	M	M	-F	M	O	Generated internally by host. Maximum 10Ω link to COM. If low host is present.
-	7	7	Transmit Data	TX_MT	Output	Y	Serial NRZ line code, logic0=high	O	O	F-	O	O	UART connection, protocol undefined in this document.
-	8	8	Receive Data (Rx)	RX_MT	Input	Y	Serial NRZ line code, logic0=high	O	O	F-	O	O	UART connection, protocol undefined in this document. For future use.
-	9	9	AC Lost	AC_LO	Output	Y	Active high (no AC present)	O	O	F-	O	O	Rapid signal for AC presence lost detected by Host. Not for use with CSP CH
-	10	10	-	CSP_A	-	-	For use by CSP	F	O	F-	F	O	

Connection

M: Mandatory

O: Optional

F: Forbidden

-	11	11	-	CSP_B	-	-	For use by CSP	F	O	F-	F	O	
-	12	12	-	CSP_C	-	-	For use by CSP	F	O	F-	F	O	
-	13	13	-	RMM_B	-	-	Reserved for use by ESME manufacturer	O	F	F-	O	O	
-	14	14	-	RMM_C	-	-	Reserved for use by ESME	O	F	F-	O	O	
-	-	15	-	RMM_D	-	-	Reserved for use by ESME	O	F	F-	O	O	
-	-	16	-	RMM_E	-	-	Reserved for use by ESME	O	F	F-	O	O	
-	-	17	-	RMM_F	-	-	Reserved for use by ESME	O	F	F-	O	O	
-	-	18	-	CSP_D	-	-	For use by CSP	F	O	F-	F	O	
-	-	19	-	CSP_E	-	-	For use by CSP	F	O	F-	F	O	
-	-	20	-	CSP_F	-	-	For use by CSP	F	O	F-	F	O	

Notes:

- 'M', 'O' and 'F' demote mandatory, optional and forbidden respectively
- Column heading notes:
    a. I/O - Inputs and outputs are defined from the perspective of the Host
    b. Pull-up - resistors are required on specified data lines within the Communications Hub, except for RX_MT, in which it is fitted internal to the ESME. Data lines are open-collector / open-drain with a maximum of 5V output
- Pins that are optional for both host and CH may be used by either but the Host manufacturer must declare this use to the DCC via its ICHIS WG and for publishing on DCC website

E1.3.1 MT_PR

MT_PR is used by a Communications Hub to detect the presence (or lack thereof) of the female socket of the ICHI provided by a Host. A Host shall provide a low impedance connection of no more than 10Ω between MT_PR and COM.

E1.3.2 CH_PR

CH_PR is used by an ESME to detect the presence (or lack thereof) of the male connector of the ICHI provided by a Device. A Device shall provide a low impedance connection of no more than 10Ω between CH_PR and COM.

E1.3.3 TX_MT / RX_MT

TX_MT and RX_MT are UART data transmission connections. They are not used for this iteration of the ICHIS, but are defined as data connections for future use.

E1.3.4 AC_LO, RMM_B-F

AC_LO and RMM_B, C, D, E, F will not be used for UK application in this iteration of ICHIS. These pins are reserved for ESME manufacturers' use in foreign markets, and/or potential use in future iterations of ICHIS for use in Great Britain.

E1.3.5 CSP_A-F

CSP_A, B, C, D, E, F are reserved for use by the CSPs. Hosts shall not connect to these pins (though shall cater for their physical presence).

E2.0 General requirements for Digital Signalling Pins

E2.1 Performance Requirements for Open-collector Outputs

Symbol	Connector	Logical Low Voltage, $R_{pull-up} \geq 1.0\ k\Omega$	Logical High Voltage, $R_{pull-up} \leq 100\ k\Omega$
TX_MT	ESME	≤ 1.0 V	$\geq (V_{logic} - 0.5\ V)$
AC_LO	ESME	≤ 1.0 V	$\geq (V_{logic} - 0.5\ V)$
RX_MT	CH	≤ 1.0 V	$\geq (V_{logic} - 0.5\ V)$

Notes:

1. Applicable over declared operating temperature range.
2. For DC rails of $3.0\ V \leq V_{logic} < 5.0\ V$.
3. Current drawn from each pin may not exceed 4mA.

E2.2 EMC Requirements on Data Lines

ESME manufacturers may assume that the CH generates conducted emissions onto the data lines within the limits given in ETSI EN 301 489-1, section 8.7.3 (i.e. compliant with the class B equipment limits for telecommunication ports given in BS EN 550322). The ESME shall have a compatible level of immunity at its data line connections.

ESME manufacturers may assume that the CH has a level of immunity to common mode RF signals on its data line connections as is specified in ETSI EN 301 498-1 section 9.5 – for radio equipment for use with cables longer than 3m. The common mode RF emissions from the ESME, on the data line connections, shall be limited so as to be compatible with this level of immunity.

E3.0 ~~Specific requirements for Digital Signalling Pins~~Section Not Used

~~E3.1 Specific requirements for Communications Hubs~~

~~E3.1.1 Mandatory Connections~~

~~Section Removed~~

~~Pin~~	~~Symbol~~	~~Name~~	~~Use~~
~~1~~	~~+12V~~	~~+12V~~	~~12V DC from which power for the CH is drawn~~
~~2~~	~~+12V~~	~~+12V~~	~~12V DC from which power for the CH is drawn~~
~~3~~	~~COM~~	~~Common~~	~~Common DC power supply rail~~
~~4~~	~~COM~~	~~Common~~	~~Common DC power supply rail~~
~~5~~	~~CH_PR~~	~~Device Present~~	~~Maximum 10Ω link to COM~~
~~6~~	~~MT_PR~~	~~Host Present~~	~~If this input is low, the Host is present~~

~~E3.1.2 Optional Connections~~

~~Pin~~	~~Symbol~~	~~Name~~	~~Use~~
~~7~~	~~TX_MT~~	~~Transmit Data (Tx)~~	~~UART connection, protocol undefined in this document~~
~~8~~	~~RX_MT~~	~~Receive Data (Rx)~~	~~UART connection, protocol undefined in this document~~
~~9~~	~~AC_LO~~	~~AC Lost~~	~~Rapid signal for AC presence lost detected by ESME. Not for use with CSP Communications Hubs~~

~~E3.1.3 Forbidden Connections~~

~~Pin~~	~~Symbol~~	~~Name~~	~~Use~~
~~13~~	~~RMM_B~~	~~Reserved~~	~~Reserved for ESME manufacturers~~

Pin	Symbol	Name	Use
14	RMM_C	Reserved	Reserved for ESME manufacturers
15	RMM_D	Reserved	Reserved for ESME manufacturers
16	RMM_E	Reserved	Reserved for ESME manufacturers
17	RMM_F	Reserved	Reserved for ESME manufacturers

E3.2 Specific requirements for Blanking Plates

E3.2.1 Mandatory Connections

Pin	Symbol	Name	Use
3	COM	Common	Common DC power supply rail
5	CH_PR	Device Present	Maximum 10Ω link to COM

E3.2.2 Optional Connections

None

E3.2.3 Forbidden Connections

None

E3.3 Specific requirements for single phase ESMEs

E3.3.1 Mandatory Connections

Pin	Symbol	Name	Use
1	+12V	+12V	12V DC providing power to the CH
2	+12V	+12V	12V DC providing power to the CH
3	COM	Common	Common DC power supply rail
4	COM	Common	Common DC power supply rail
5	CH_PR	Device Present	If this input is low, the Device is present

Pin	Symbol	Name	Use
6	MT_PR	Host Present	Maximum 10Ω link to COM

E3.3.2 Optional Connections

Pin	Symbol	Name	Use
7	TX_MT	Transmit Data (Tx)	UART connection, protocol undefined in this document
8	RX_MT	Receive Data (Rx)	UART connection, protocol undefined in this document
9	AC_LO	AC Lost	Rapid signal for AC presence lost detected by ESME. Not for use with CSP Communications Hubs
13	RMM_B	Reserved	Reserved for ESME manufacturers
14	RMM_C	Reserved	Reserved for ESME manufacturers
15	RMM_D	Reserved	Reserved for ESME manufacturers
16	RMM_E	Reserved	Reserved for ESME manufacturers
17	RMM_F	Reserved	Reserved for ESME manufacturers

E3.3.3 Forbidden Connections

Pin	Symbol	Name	Use
10	CSP_A	Reserved	Reserved for use by CSP. No connection from ESME permitted
11	CSP_B	Reserved	Reserved for use by CSP. No connection from ESME permitted
12	CSP_C	Reserved	Reserved for use by CSP. No connection from ESME permitted
18	CSP_D	Reserved	Reserved for use by CSP. No connection from ESME permitted

Pin	Symbol	Name	Use
19	CSP_E	Reserved	Reserved for use by CSP. No connection from ESME permitted
20	CSP_F	Reserved	Reserved for use by CSP. No connection from ESME permitted

E3.4 Specific requirements for twin element ESMEs

Same as single phase ESMEs, see E3.3

E3.5 Specific requirements for polyphase ESMEs

Same as single phase ESMEs, see E3.3

E3.6 Specific requirements for Hot Shoes

E3.6.1 Mandatory Connections

Pin	Symbol	Name	Use
1	+12V	+12V	12V DC providing power to the CH
2	+12V	+12V	12V DC providing power to the CH
3	COM	Common	Common DC power supply rail
4	COM	Common	Common DC power supply rail
6	MT_PR	Host Present	Maximum 10Ω link to COM

E3.6.2 Optional Connections

Pin	Symbol	Name	Use
5	CH_PR	Device Present	Maximum 10Ω link to COM – unlikely to be detected by a Hot Shoe
7	TX_MT	Transmit Data (Tx)	UART connection, protocol undefined in this document
8	RX_MT	Receive Data (Rx)	UART connection, protocol undefined in this document

Pin	Symbol	Name	Use
9	AC_LO	AC Lost	Rapid signal for AC presence lost detected by Hot Shoe. Not for use with CSP Communications Hubs
13	RMM_B	Reserved	Reserved for ESME manufacturers
14	RMM_C	Reserved	Reserved for ESME manufacturers
15	RMM_D	Reserved	Reserved for ESME manufacturers
16	RMM_E	Reserved	Reserved for ESME manufacturers
17	RMM_F	Reserved	Reserved for ESME manufacturers

E3.6.3 Forbidden Connections

Pin	Symbol	Name	Use
10	CSP_A	Reserved	Reserved for use by CSP. No connection from ESME permitted
11	CSP_B	Reserved	Reserved for use by CSP. No connection from ESME permitted
12	CSP_C	Reserved	Reserved for use by CSP. No connection from ESME permitted
18	CSP_D	Reserved	Reserved for use by CSP. No connection from ESME permitted
19	CSP_E	Reserved	Reserved for use by CSP. No connection from ESME permitted
20	CSP_F	Reserved	Reserved for use by CSP. No connection from ESME permitted

E3.7 Specific requirements for Cradles

Same as Hot Shoe, see E3.6. The MT_PR signal shall be generated inside the Cradle, and not carried over a flying lead to an Adaptor.

E3.8 Specific requirements for Adaptors

E3.8.1 Mandatory Connections

Pin	Symbol	Name	Use
1	+12V	+12V	12V DC from which power for the CH is drawn
2	+12V	+12V	12V DC from which power for the CH is drawn
3	COM	Common	Common DC power supply rail
4	COM	Common	Common DC power supply rail
5	CH_PR	Device Present	Maximum 10Ω link to COM. This signal shall not be carried over a flying lead to a Cradle.

E3.8.2 Optional Connections

All other connections

E3.8.3 Forbidden Connections

None

Part F RF Implementation

F1.0 Design ~~Considerations~~Requirement

F1.1 Rationale

Due to the close proximity of the Host and ICH, it is necessary to consider the influence of the Host and Device on one another in more detail than that provided by the International Standards, in which testing is carried out at 3 metres. It is important to note that the International Standards do not consider Near Field Effects which are expected to play a significant role at the distances and frequencies critical to ICH performance.

The design of the Host shall be such that it does not radiate noise beyond the specified Noise Limit (see Appendix B) ~~have a significant detrimental effect on the performance of the ICH~~ in order that the CSP can deliver maximum coverage and reliability from the ICH. The following sections provide information how to test radiated noise.

~~In this context, performance of the ICH will be measured using Bit Error Rate (BER).~~

This Part F is in addition to all other RF requirements, either within ICHIS or other applicable specifications for a Host or an ICH. Consideration shall be made during development of an ICH to avoid adverse effects on the operation of the Host, but any ESME acting as Host shall be required to conform to the existing metering standards concerning measurement impact from external RF noise.

F1.2 Antenna Placement

Due to the diverse nature of Host and ICH designs, it is not possible to mandate exact placement of antenna in either Host or Device, so a prohibited zone around the interface is defined.

ESME manufacturers shall place their antenna as far away from the ICHI as practical, no closer than 20mm from the horizontal datum through the centre of the ESME interface. Placement outside this prohibited zone will also take into consideration any impact on the metrology components and impact on performance relating to the presence of AC power or metalwork.

ICH manufacturers shall place their antenna(s) as far away from the ICHI as practical, no closer than 15mm from the horizontal datum through the centre of the ICH interface connector. Placement outside this prohibited zone will also take into consideration any impact on the ICH internal components and the impact on performance relating to the potential presence multiple radios/antennas.

Placement of an antenna outside of the prohibited zone cannot be interpreted as a guarantee of satisfactory performance. Device and Host manufacturers must still follow the test procedure in this document in order to ensure compliance.

Figure F1.2-1 shows the antenna exclusion area, using an example ESME and ICH.

Antennas shall not be placed in the grey shaded area.

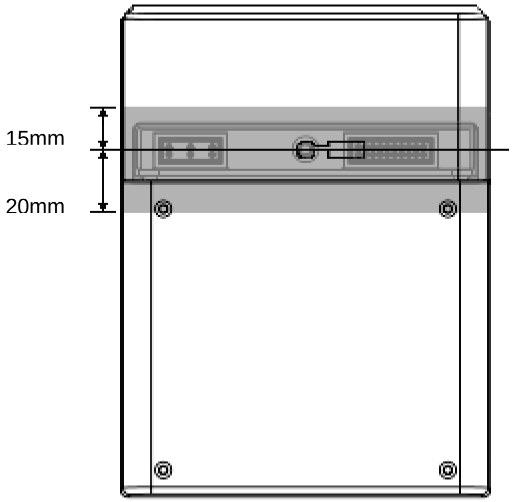


Figure F1.2-1 Prohibited antenna area (not to scale)

F1.3 ~~Future Considerations~~Section Not Used

~~addition to any frequencies specified by CH manufacturers at the time of publication of this document, ESME and ICH manufacturers should be aware that there is an intention to introduce variants including 868MHz ZigBee in the future, when it becomes available.~~

F2.0 Testing Methodology for Hosts

~~A Host shall not radiate beyond the limits specified in the datasheets for the~~ in the Appendix ~~A~~section F1.3 on the different frequency bands~~ies~~ of the CSPCH HANs and WAN.s

~~CH variant of interest which will include the receive frequencies of the CSP WANs and HANs.~~

~~The key frequencies include:~~

~~423MHz~~

~~455MHz~~

~~869MHz (WAN - Mesh)~~[9]

~~868 MHz (HAN)~~[10]

~~900MHz~~The Frequency bands are given below and testing of the Host against these frequencies is conducted using a CHAS. The CHAS variants that are required to be

~~[9] 869 MHz frequency is defined for RF mesh technology (IEEE 802.14g-2012).~~

~~[10] 868 MHz is Sub-GHz HAN frequency~~

tested against to provide a result for each of the frequency bands are included in Appendix A. The ICHIS Test Specification defines test equipment setting to test these different frequency bands. The ICHIS Test Specification defines test equipment settings to test these different frequency bands.

Frequency Band (MHz)	Start Frequency (MHz)	Stop Frequency (MHz)	Mid Frequency (MHz)	HAN/WAN
423	422	424	423	WAN (includes 'buddy mode')
868	863	876	870	HAN
900	925	960	943	WAN
2100	2110	2170	2140	WAN
2400	2400 2402.5	2483.5	2442	HAN
869	869	870	869.5	WAN MESH

F2.1 ICHIS Test Specification

Version 10 of the ICHIS Test Specification is published on the SmartDCC Ltd website at the following location:

https://www.smartdcc.co.uk/document-centre/communications-hubs/intimate-communications-hub-interface-specification/

- Host under Test (HUT)
- Communications Hub Antenna Structure Test Equipment (CHAS) for each Communications Hub variant
- Anechoic Chamber or RF-proof compartment
- Low Noise Amplifier (LNA) powered by a noiseless source such as a battery
- Spectrum Analyzer (SA)

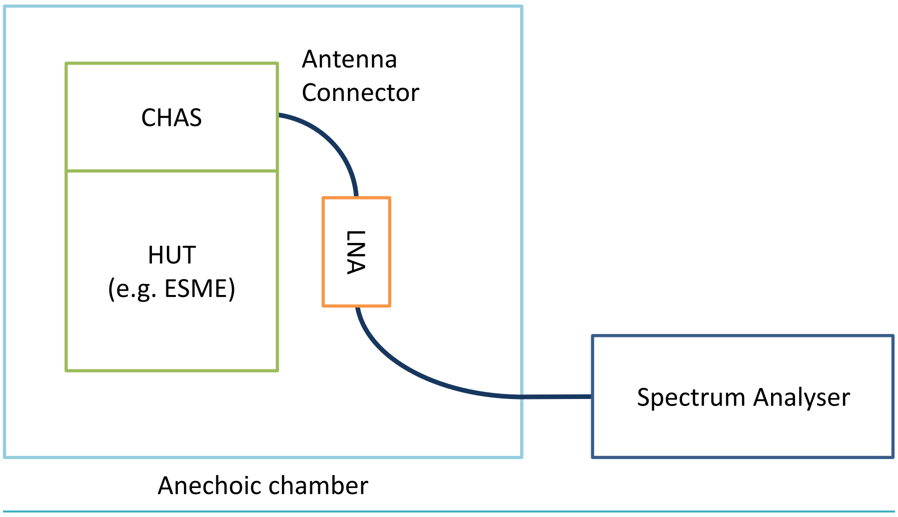


Figure F2.1-1 Test setup for Host validation

The Host manufacturer will locate the CHAS, in the same mounting position as defined in ICHIS, on the Host under test, in a test environment free of other sources of noise or RF interference.

If any radios are present in the Host, the tests below shall be carried out successively:

1. with the radios in receive mode only
2. with the radios activated in a manner representative of the worst-case scenario

The CH datasheet for each variant will define, if applicable, separate emission limits for each test in the relevant frequency band.

The Spectrum Analyser will be used to record the nature of the noise being emitted from the Host, as induced in the Test Harness ICH antenna(s).

Care should be taken to keep the losses (cable or otherwise) between the CHAS and the LNA as low as possible to minimize the cascaded noise figure.

For the specified equipment used in these measurements, Equation 1 and Equation 2 show the calculations for the noise floor of the measurement system and the offset of the measured signal level. provides the calculation for the effect the Host's noise will have on the ICH receiver.

$$\text{Noise Floor} = \textit{Thermal Noise Floor} + \textit{Cable loss from Antenna to LNA} + \textit{Noise Figure of LNA}$$

Equation 1: Calculation of the Expected Noise Floor of the Measurement System

$$\text{Offset in Signal Level} = \textit{LNA Gain} - \textit{Total Cabling Loss}$$

Equation 2: Calculation of the Signal Level Offset

F2.2 RF Isolation RecommendationsSection Not Used

Care must be taken to prevent accidentally extending or altering the radiating structures or the HUT and CHAS's environment.

The CHAS's coaxial connection shall be isolated from common-mode currents , e.g. by placing ferrite beads along the coaxial cabling as close to the antenna as possible. Without this precaution, the cable itself could become part of the radiating structure and alter the measurement results.

The HUT's power connections should originate from a filtered 230V 50Hz AC power source. These wires should include clamp-on ferrite beads every 30cm to prevent any portion of the wiring from being an efficient antenna that could re-radiate the signals being measured. If the Host is an ESME, the tests below shall be performed according to the measurement setup description in the relevant CH datasheet.

The CHAS shall be connected to the HUT's ground and DC power supply pins through the ICHI data connector. The CHAS shall provide a resistive load on the ICHI DC power connector which draws from the HUT's power supply.

F2.3 Test Setup RequirementsSection Not Used

In the condition where the HUT is not powered, the following test environment conditions shall apply.

The noise of the measurement system (LNA noise figure + cable loss before LNA) shall be below 1.5dB when performing the tests.

The absolute level of the thermal noise (Equation 1 above) shall be within ±3dB of the Expected Noise Floor.

F2.4 Determining levelsSection Not Used

Specific settings for the Spectrum Analyser will be provided in the CH datasheet. These settings may change between CH variants and frequency bands, and shall be used for both background noise and active noise checks.

With the HUT unpowered, the background noise level shall be measured in each frequency band of the relevant CHAS, ensuring that they are within the limits specified in F2.3.

The HUT shall then be powered on and left to warm up and settle for 10 minutes, including the DC power supply and any AC power loads drawn. The noise floor shall be measured and recorded.

The noise measurement for each frequency band shall then be compared against the limits in the datasheets for the CH variant of interest. These datasheets will be published via the SmartDCC Ltd website.

F3.0 Recommendations for ESME transmission on the HAN Section Not Used.

To reduce the likelihood of front end overload on the Communications Hub HAN radio, an ESME which has an ICH mounted to it should maintain transmission levels to the lowest level possible, relying on the ZigBee Meshing through the Communications Hub for message transmissions to other HAN products. It is recommended that the ESME use ZigBee received signal strength to detect the presence of an ICH. Power drain from the ICHI cannot be relied upon to provide this detection due to the possibility of an Adapter, flying lead and Cradle arrangement.nt.

F4.0 Methodology for Testing Multiple ESME

Informative

It is recognised that a variety of factors may influence the testing outcome, including variation within the measurement environment or the Host devices. Testing multiple Hosts will provide a better indication of the performance of a given Host model (hardware and firmware version) and therefore the extent to which it meets the relevant Noise Limit. This section is written from the perspective of the ESME but a similar approach can be used for other Hosts.

Appendix B – specifies the Noise Limit. The Noise Limit quoted represents a specified limit, against which a Host is tested using Part F2.1 and should be used as a minimum to demonstrate compliance of tested Host by using the methodology to equate the Noise Limit to the measured RF implementation test results, including an allowance for measurement and host variability.

Test Requirement

For a given Host to meet the RF implementation requirements set out in Part F of this document the following is required:

- A minimum of 8 ESME are required to achieve a pass using the test specification at F2.1 and the method and pass criteria outlined in F4.0. Each of the ESME must be identical (same hardware and firmware versions);
- Each ESME must be tested once with each of the CHAS units detailed in Appendix A - for all frequencies on each CHAS.

Retesting Requirements

A variety of factors can influence the performance of a Host. Such factors may impact the ability of the Host to meet the RF implementation requirements in Part F and therefore consideration must be given to these factors and the need to retest and validate that the Host remains compliant with the Noise Limits.

The factors include:

- Changes to Host hardware or firmware. Every change to firmware or hardware of the Host should be assessed as to the extent to which it may impact its ability to meet the RF Noise Limits and hence the need for retest.
- Changes to Host manufacturing processes. These could include intended changes, such as the move to a new manufacturing process or facility, or unintended changes which may result from manufacturing tolerances and any drift in these tolerances. These and other factors should be considered and a methodology should be developed to validate that the performance of the Host remains consistent with respect to its ability to meet the RF Noise Limits including any triggers for retest.

The test methodology set out in this section has been through various iterations. Hosts that have been installed on the basis of testing using a previous test approach are not required to be retested.

Test Method

Initial Condition: ESME to be tested must have any radio disabled, as per the ICHIS Test Specification.

Test Steps: ESME must be tested for all applicable HAN and WAN frequencies of the CHAS units detailed in Appendix A – according to the ICHIS Test Specification.

Pass Criteria for 423MHz, 868MHz, 900-MHz frequency bands:

For a "pass" test result, the following criteria must be met:

1. Mean of Noise Result- ≤ Noise Limit + Measurement Accuracy

   Where:

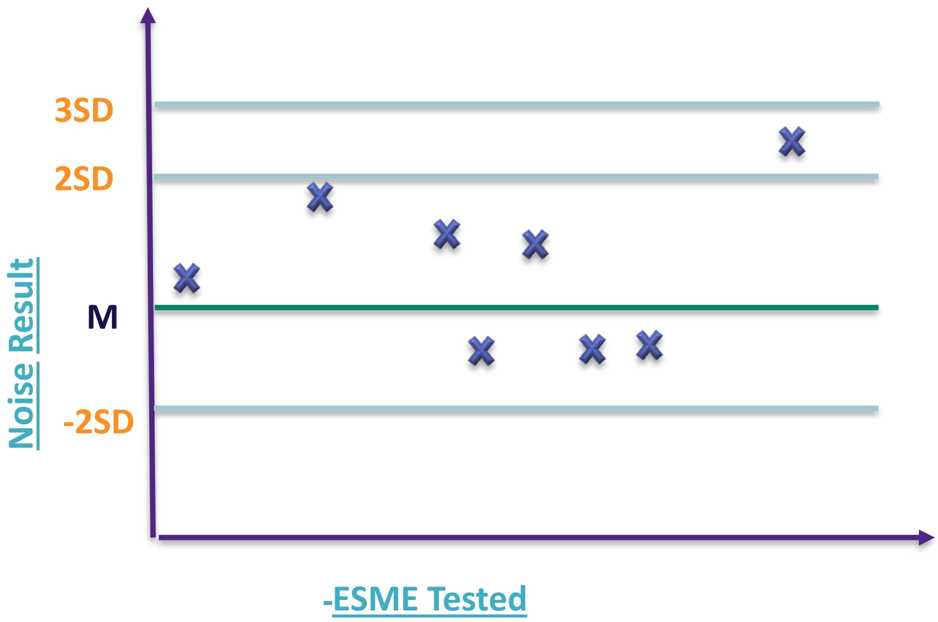
   - Mean of Noise Result is calculated by taking the mean of the 8 Noise Results from the 8 ESME tested at a given frequency.
     - Noise Result is the individual noise value for an ESME at a given frequency as measured and calculated using the ICHIS Test Specification
     - Noise Limit for the given frequency is defined in Appendix B –
   - Measurement Accuracy of the test equipment used (as defined in the ICHIS Test Specification, must be less than 0.5dB)

2. At least seven Noise Results must be lower than the sum of 2SD and the Mean of Noise Result. 2SD is defined in the table below for each frequency band and is a reflection of the measurement variability (standard deviation) associated with testing an ESME multiple times.
3. No Noise Result can be greater than the sum of 3SD plus Mean of Noise Result. 3SD is defined in the table below for each frequency band and is a reflection of the measurement variability (standard deviation) associated with testing an ESME multiple times.
4. Three plots of Noise Results (corresponding to 423MHz, 868MHz and 900MHz) for review by DCC and CSPs (as per example below).

Definition of 2SD and 3SD values used in pass criteria for 423MHz, 868MHz and 900 MHz frequency bands:

Frequency Band	2SD	3SD
423MHz	1.4dB	2.1dB
868MHz	1.1dB	1.6dB
900MHz	2.0dB	3.1dB

Example Noise Result plot for pass criteria for 423MHz, 868MHz and 900MHz frequency bands:



Pass criteria for 2.1GHz and 2.4GHz frequency bands

For a "pass" test result, the following criteria must be met by all 8 meters:

Noise Result ≤ Noise Limit + 1.0dB

~~F4.0~~F5.0 Installation of a Host emitting RF noise at 423MHz

~~F4.1~~F5.1

Notwithstanding the provisions in Part F~~2.0~~, for the period up to 30 September 2019 a Host that emits a level of RF noise less than or equal to 17dB at the 423MHz frequency will be considered to have met the provisions of Part F~~2.0~~.

~~F4.2~~F5.2

The provisions of ~~F4.1~~ Part F5.1 are applicable only if the Host is installed in those postcode areas specified by the version of the SM WAN Coverage Database relevant to the installation at the time.

~~F4.3~~F5.3

Hosts that are installed up to and including 30 September 2019 in accordance with the provisions of ~~F4.1~~ Part F5.1 shall continue to be considered to have met the provisions of Part F~~2.0~~ beyond 30 September 2019.

~~F5.0~~F6.0 Installation of a Host emitting RF noise in the 900MHz band

~~F5.1~~F6.1

Notwithstanding the provisions in Part F~~2.0~~, for the period up to 30 September 2019 a Host that emits a level of RF noise less than or equal to 6.5dB in the 900MHz frequency band will be considered to have met the provision of Part F~~2.0~~.

~~F5.2~~F6.2

Notwithstanding the provisions in Part F~~2.0~~, for the period up to 30 September 2019 a Host that emits a level of RF noise above 6.5dB in the 900MHz frequency band will be considered to have met the provision of Part F~~2.0~~ providing it has received written confirmation from the DCC as to having undergone successful RF noise evaluation.

~~F5.3~~F6.3

Hosts that are installed up to and including 30 September 2019 in accordance with the provisions of F6.1 or F6.2 shall continue to be considered to have met the provisions of Part F~~2.0~~ beyond 30 September 2019.

F6.0F7.0 Installation of a Host emitting RF noise in the 2.4GHz (HAN) band

F6.1F7.1

Notwithstanding the provisions in Part F2.0, for the period up to 30 September 2019 a Host that emits a level of RF noise less than or equal to 4dB in the 2.4GHz (HAN) frequency band will be considered to have met the provision of Part F2.0.

F6.2F7.2

Hosts that are installed up to and including 30 September 2019 in accordance with the provisions of Part F7.1 shall continue to be considered to have met the provisions of Part F2.0 beyond 30 September 2019.

F7.0F8.0 Installation of a Host emitting RF noise in the 868MHz (HAN) band

F7.1F8.1

Notwithstanding the provisions in Part F2.0, for the period up to 30 September 2019 a Host that emits a level of RF noise less than or equal to 7dB in the 868MHz (HAN) frequency band will be considered to have met the provision of Part F2.0.

F7.2F8.2

Hosts that are installed up to and including 30 September 2019 in accordance with the provisions of F8.1 shall continue to be considered to have met the provisions of Part F2.0 beyond 30 September 2019.

Part G Security

G1.0 Physical security

G1.1 Mechanical security

Mechanical security for the ICHIS is provided by the sealing screw, as defined in ~~sections~~ Part B1.6.1 and B1.6.2. ~~Tamper Evident labels may also be applied to the interface between the Host and ICH, and ESME and Device, if desired.~~

G1.2 Tamper detection

Electronic tamper detection for the Host and Device is provided by the pins means described in ~~section~~ Part ~~E3.0~~E3.0.

G1.3 Scope of secure perimeter

The secure perimeter has been defined as covering only Hosts and Devices which are directly connected. As such, it excludes any flying lead between an Adaptor and Cradle, but will detect removal of the CH from the Cradle, or the Adaptor from the ESME.

G2.0 Out of scope areas

This specification does not cover security of any protocols used to communicate with either the ESME or ICH. This includes any protocols used over ZigBee HAN, SMWAN or wired HAN (including PLC), as well as any custom interfaces offered by the ESME or ICH for manufacturer purposes.

No consideration is made for other interfaces offered by an ICH or ESME, for instance a port for an external aerial. Such interfaces shall be secured appropriately by the ICH or ESME manufacturer.

Appendix A – CHAS Details

CHAS Units used for Test

Introduction

This appendix section details the four CHAS units (below) which are used for testing against the ICHIS Test Specification. Testing on these CHAS variants will give a result that can be relied upon against all relevant frequencies, regardless of the CH variant the Host is joined to. Further rationale is provided below.

CHAS Units used for Test

- WNC DBCH CHAS
- TOSHIBA DBCH CHAS (SKU7)
- EDMI SBCH CHAS
- EDMI DBCH CHAS

Any Host that has passed the HAN 868MHz enduring limit (as per Appendix B) is also considered to have passed the WAN 869MHz (Mesh Frequency) enduring limit (which therefore is not included in Appendix B).

Power Consumption

The CHAS unit is a passive device, and as such will not have an active power consumption. To simulate a power draw, a resistive element is placed across the ICHIS power pins that consumes less than 6W

Rationale for CHAS selection

S.N	CHAS	Reason for Selection
1.	WNC DBCH	• WAN and HAN Antenna position ~~are~~are different for Dual Band WNC and Dual Band Toshiba WAN and HAN Antenna position of WNC Single Band CHAS and WNC Dual Band CHAS is similar. • Only difference in HAN is the antenna to include Sub-GHz frequencies WNC DB CHAS units are based on a DBCH cellular

2.	TOSHIBA DBCH (SKU7)	• WAN and HAN Antenna positions are different for Dual Band WNC and Dual Band Toshiba unit • WAN and HAN Antenna positions of Toshiba Single Band CHAS and Toshiba Dual Band CHAS are similar • Only difference in HAN antenna to include Sub-GHz frequencies Toshiba DB CHAS (SKU7) units are based on a DBCH Cellular .
3.	EDMI SBCH	• WAN and HAN antennas are in different positions for EDMI SBCH and EDMI DBCH due to the dDifference in height of Single Band CHAS and Dual Band CHAS
4.	EDMI DBCH	• WAN and HAN antennas are in different positions for EDMI SBCH and EDMI DBCH due to the difference in height of Single Band CHAS and Dual Band CHAS

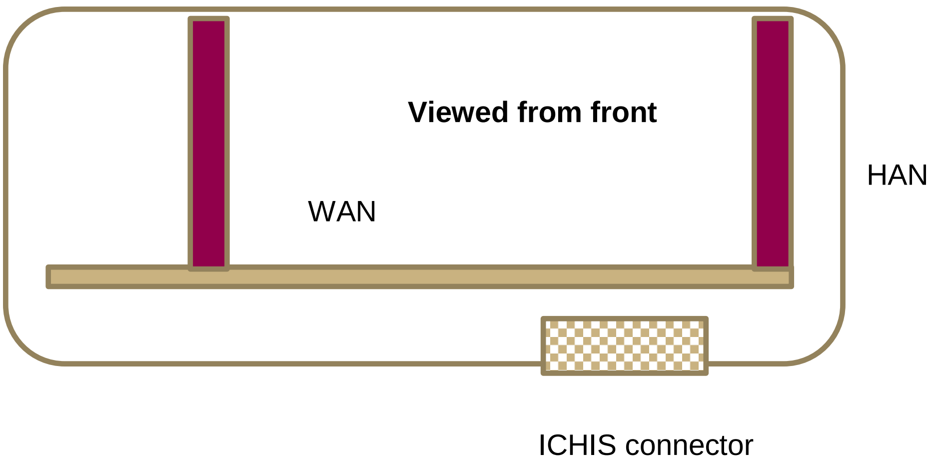
CHAS Antenna Placement

Introduction

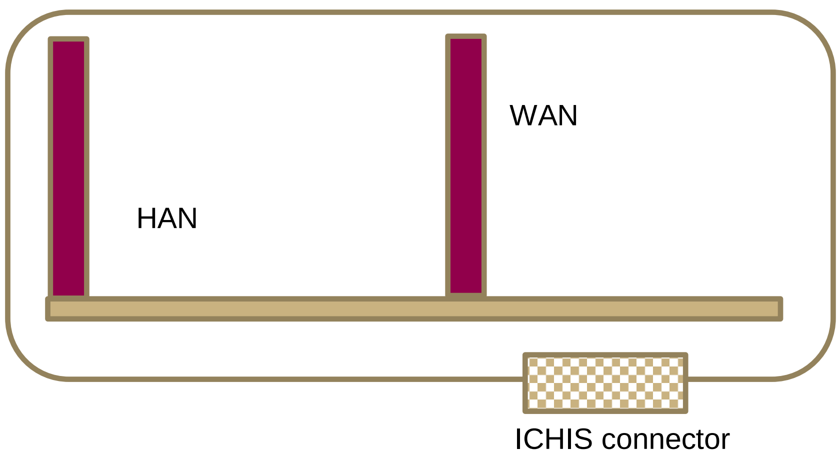
This appendix section details the antenna placements in the CHAS (and therefore relevant CH variant).

The following diagrams represent the antenna positioning within the CHAS representing each Communications Hub

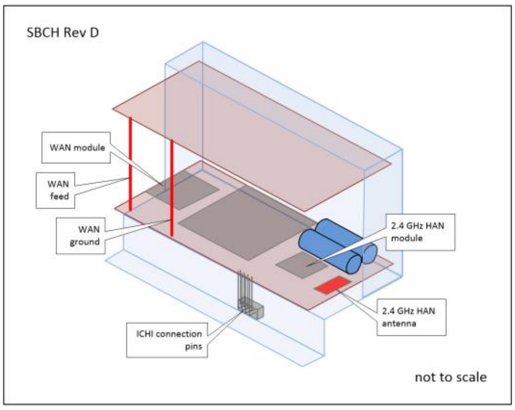
WNC CHAS



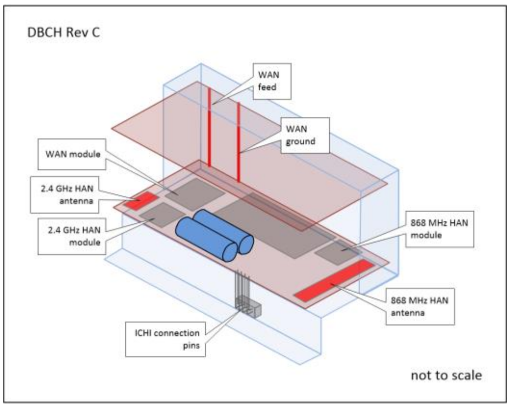
TOSHIBA CHAS (SKU7)



EDMI SBCH



EDMI DBCH



Appendix B – Noise Limits

Noise Limits

Introduction

This appendix section details the Noise Limits for each frequency band

Frequency Band (MHz)	Noise Limit (dB)	CHAS	WAN/HAN
423	≤7.0	EDMI (SBCH/DBCH)	WAN
900	≤3.5	WNC/TOSH (SKU7) (DBCH)	WAN
2100	≤3.0	WNC/TOSH(SKU7) (DBCH)	WAN
2400	≤3.5	All CHAS units	HAN
868	≤5.0	EDMI DBCH/WNC DBCH/TOSH DBCH	HAN