



Sky Homes Specification for a Fibre Integrated Reception System

(Incorporating digital Channel Stacking technologies & Sky Q™ compatibility)

New Build MDU

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INTRODUCTION: PURPOSE OF THIS DOCUMENT

This document sets out a summary Specification of requirements for communal television aerial systems to be installed in residential or commercial buildings. We recommend that all systems should be designed and installed to meet these standards. However, this does not preclude individual *Builders* from varying the Specifications or adding supplementary requirements to meet local needs.

This document is intended for purposes of preliminary planning and tendering. It may be incorporated in specific legal agreements between individual Landlords and installing Contractors. However it must be used in its entirety, extracts may not be used in isolation. Copyright in this document belongs to Sky (UK) Ltd

The systems to be installed constitute Integrated Reception Systems as defined by Sky Homes. The intended effect of such a system is to provide a full range of television signals (satellite and terrestrial) and radio (both FM and DAB) to every home covered by the system. This also encompasses the requirements of digital channel stacking technologies as required for the reception of Sky's 'Sky Q™' platform. This broad range is intended to provide the widest possible choice to occupiers in deciding which broadcast services to use. It will also enable the provision of interactive TV services and an infrastructure for local security and information systems.

In order to provide this range of facilities, every Fibre IRS must incorporate, besides appropriate aerial, satellite dish and headend equipment, a system of independent cabling to every home and specific outlets, as described in these specifications, within every home. These items are all described in the succeeding pages.

This document also describes in outline the procedures required for planning the individual systems, for reporting and keeping records of work done, and for managing changes agreed while work is in progress. Conformity with these administrative provisions will be an essential part of the contract.

Whilst we have taken considerable care to verify the accuracy and validity of the information contained in this Specification, Sky (UK) Ltd disclaims any responsibility for faults arising in the specified equipment or from the manner of its installation. Every user of this Specification should check the information provided to it hereunder and must take responsibility for the reliance placed on this document and any agreed variation to it. Furthermore we will not be liable to you under any circumstances whatsoever for any, indirect, consequential, or special damages arising from your use of or reliance on this Specification.

GENERAL

The Contractor shall supply, install, test and commission a Fibre Optic Integrated Reception System, comprising of suitable terrestrial and satellite antennas along with the relevant signal filtration and power distribution providing a single Fibre Optic Cable carrying the satellite IF bands stacked in the frequency range 0.95 to 5.45 GHz together with the terrestrial frequencies between 87.5MHz & 790MHz. These signals should be output on a single mode fibre from the head-end using 1310nm or 1550nm lasers feeding a PON (Passive Optical Network).

The PON distribution network will consist of either dual window (1310/1550nm) passive optical splitters or taps couplers with the optical loss not exceeding those detailed in the manufacturer's link budget specifications.

Each termination, minimum of one position in each dwelling, will feed a single F-IRS optical convertor. Alternatively a Digital Terrestrial only optical convertor may be used in preparation for future upgrade to full F-IRS within the buildings listed in the schedule agreed with the Contractor.

The Contractor will confirm the addresses, including postcodes, which have been attached to the given headend detailing the type of optical convertor installed (F-IRS or DTT only), once the Installation is complete.

The systems shall comply with the current technical conditions of the Licensing Authorities. It will be the responsibility of the Contractor to determine the requirement for any licences and apply for any licence that a building may require. Sky (UK) Ltd will not be responsible for the non-application of any licence.

The Contractor shall be a member of the Confederation of Aerial Industries and have the relevant qualifications for Television Distribution Systems. Where a non-employed sub-contractor is used, then the primary aerial installation Contractor will remain responsible for the sub-contractor's work.

ERRORS

Where the Contractor believes that these Specifications are incomplete in any respect or that additional details are required for the satisfactory and safe operation of the proposed systems, the Contractor shall notify the *Builder* immediately and shall be responsible for developing the necessary additional Specifications and ensuring that the proposed system can be operated in a satisfactory and safe manner.

SERVICES

The services to be provided at the output of the optical convertor unit using the proposed system are as follows:

SERVICE	PROGRAMMES	FREQUENCY
Terrestrial Digital	BBCA	UHF
	D3+4	UHF
	BBC B (HD)	UHF
	SDN	UHF
	ARQ A	UHF
	ARQ B	UHF
	COM 7 (HD)	UHF
	COM 8 (HD)	UHF
		Additional HD multiplexes may be added up to a maximum of 8 in total
Satellite Digital	All Horizontal and Vertical transmissions, both Low Band and High Band from the 28 degree east orbital position, in the transmission range from 10,700 MHz – 12,750 MHz.	IF
FM Radio	The national services legally transmitted to the general area of the site concerned.	Band II
DAB	The Radio programmes provided by the DAB services.	Band III
Closed Circuit TV Camera	Where applicable by converting to a Digital Mux	UHF

The Contractor must perform a site test at each location to determine that all the services listed above are available at the levels required for distribution (see below). If any service is, as a result of the site test, found not to be available this must be reported to the *Builder* immediately so that an agreement may be made as to which services will be provided

SPECIFICATIONS

The systems must conform to the following standards and codes of practice:

- CENELEC BS EN 50083 - all relevant parts.
- CENELEC BS EN 50117 for coaxial cables – all relevant parts.
- CENELEC BS EN 60966 for connecting cables – all relevant parts.
- BS 4662:2006+A1:2009 – Specification for boxes for the enclosure of Electrical Accessories,
 - BS 5773:2010+A1:2014 – Specification for general requirements for Electrical Accessories.
- The Confederation of Aerials Industries Codes of Practice for Television Aerials, and TV Systems.
- The requirements of the DTG Book 8 in respect of the system for the Digital Terrestrial services (except to the extent that technical differences apply, when this Specification will override DTG book 8).
- BS 7671:2008 - All new installations from the 1st July 2015 must comply with Amendment No. 3 to BS 7671:2008
- ITU G.657 – single mode bend insensitive fibre
- BS EN 60793-2:2016 – Optical Fibres. Product specifications. General
- IEC 60825-1 Class 1 or Class 1M laser
- SCR Standard (auto detect & switch) - Sky SCR Software v2.6 (May 2015) – requires DiSEqC 1.0 or higher – with Sky proprietary extensions, CENELEC EN 50494, CENELEC EN 50607, Universal LNB Tone & Volts

PLANS

A schematic plan representing the installed system in block diagram form, showing locations of equipment, types of cables and earthing arrangements must be submitted to the *Builder* for final approval.

PERFORMANCE OF SYSTEM

It will be the responsibility of the Contractor to familiarise itself with the site and local conditions prior to tendering. The Contractor must satisfy itself that the services stated are available on each of the sites indicated, and that the quality of the signals will enable him to meet the relevant Specification requirements indicated. If any of the services are not available the Contractor must notify the *Builder* in writing.

Should the Contractor believe that the suggested plans, if supplied, do not meet the performance criteria this must be highlighted at the time of tender, together with alternative proposals.

If, in the course of the installation, the Contractor believes that plans will have to be changed, the *Builder* must be notified immediately and any costs etc. agreed between the Contractor and the *Builder* before installation work continues.

SYSTEM LEVELS

The maximum/minimum levels at each outlet position on the system are as follows.

FREQUENCY BAND	MAXIMUM LEVEL	MINIMUM LEVEL
Band II FM Radio	74 db μ V	54 db μ V
Band III DAB	65 db μ V	45 db μ V
Band IV/V Digital	77 db μ V	45 db μ V
Satellite IF Digital	77 db μ V	52 db μ V
Satellite SCR Digital	77 db μ V	52 db μ V

The BER measurements should be made after Viterbi error correction and should be better than 2×10^{-4}

The quality of reception should be assessed by ensuring that the Modulation Error Ratio (MER) meets the following requirement:

The terrestrial Digital signals will require a minimum Carrier to Noise at the outlets of 26 dB

The Satellite Digital frequencies will require a minimum Carrier to Noise at the outlets of 9 dB.

The optical power levels at the input to optical converters should be measured and recorded prior to connecting and should not exceed or fall below those as recommended by the manufacturer.

MATERIALS

All materials must be new and previously unused. All goods and materials used in providing the system shall conform to EU and national standards, where such standards have been established, and to the Codes of practice issued by the relevant industry bodies.

All equipment shall be by a Sky Homes partnering supplier, See appendix A for details.

All Equipment must be able to cope with the minimum and maximum signal levels, as approved, in the CAI SMATV Code of Practice and those levels listed above for the given frequencies in use.

No departure from the specified and/or approved materials will be accepted.

TELEVISION AND AUDIO AERIALS

The aerials will be from an approved supplier and comply with the CAI Code of Practice. The aerial support structure must be connected to the MET.

All UHF antennas must incorporate a Balun to ensure the matching of the dipole to the feeder cables.

The aerial system, mounts, support structures etc. must be capable of withstanding winds of 100mph/160kph.

SATELLITE DISHES

An 80 or 90 cm satellite dish should be used and must be constructed and mounted to withstand a wind speed of 60mph/100kph or be able to produce a 15dB carrier to noise level at the installations site, for the given transponders being received. Where reception is problematic larger dishes may be considered subject to local planning regulations.

The *Builder* must agree the final position for aerials and satellite dishes. If more than two satellite dishes are required, planning permission must be obtained.

DISH ALIGNMENT

The satellite dish should be aligned for maximum signal strength and MER using a dedicated optical TV meter, or using a universal output optical convertor with 10dB optical pad together with a conventional RF meter. The skew of the LNB should be set by optimising the MER of an appropriate transponder.

HEADEND EQUIPMENT

All headend equipment not rated for outdoor use should either be sited indoors, or housed in suitable weatherproof housing with a minimum rating of IP55.

Siting of connections between fibre cables outside should be avoided, and where this is unavoidable the connection should be protected using a gel boot or similar to prevent the incursion of water. The use of self-amalgamating tape is not permitted.

The equipment must be securely mounted and accessible for maintenance purposed in a dry secure location.

No distribution equipment must be mounted in, or accessible from, any dwelling other than where fibre is run directly to the property and into a Comms or AV area and is feeding a localised distribution system solely for the distribution within that dwelling.

SKY Q™

All equipment must be capable of supporting Sky Q™ Set Top Box installations and being switched into Single Cable Router (SCR) mode and processing and outputting a minimum of 16 digitally stacked channels at the centre frequencies as listed below.

UB Number	Centre Frequency (MHz)	UB Number	Centre Frequency (MHz)
3	1680	19	1530
9	1280	20	1580
11	1380	21	1630
14	1480	22	1730
15	980	23	1780
16	1030	24	1830
17	1080	25	1880
18	1130	26	1930

As well as complying to - SCR Standard (auto detect & switch) - Sky SCR Software v2.6 (May 2015) – requires DiSEqC 1.0 or higher – with Sky proprietary extensions, CENELEC EN 50494, CENELEC EN 50607, all equipment must be backwardly compatible and handle Universal LNB Tone & Volts switching as default.

SKY PLUS™

All installations shall be capable of supporting Sky+/Sky+HD Set top box installations. Any system designed for Sky Q will also support Sky+HD

FREESAT™

All installations shall be capable of supporting FreeSat Set Top Box installations with single or twin (PVR) feeds.

FREEVIEW™

All installations shall be capable of supporting Freeview Recievers/Tuners and carry/deliver all digital muxes where available.

CABLES AND FIXINGS

All Fibre Optic cables shall be sourced from a Sky Homes partnering supplier, see Appendix A for details, and be suitable for the environment in which it will be installed. The Contractor shall take into account any requirements for special cable constructions such as LSZH (Low Smoke Zero Halogen). The fibre shall be compliant with the G.657A standard, and the cabling should be suitably robust for installation in an MDU environment. The cable shall be non-conducting between the connectors at its two ends. In the event that the cable has to be directly buried in the ground, a cable produced specifically for this purpose should be used.

All co-axial cables shall be CAI benchmark approved digital cable of type 100 or higher and shall be manufactured to the relevant parts of Specification BS EN 50117.

The *Builder* must be consulted and approval given for all routes below paths, roads etc. as ducting requirements may vary.

No underground joints in the cables will be allowed. All joints must be made above ground, unless fusion spliced and in a suitable housing.

Where applicable (in general terms this is where the cable needs protection from possible vandalising) external cables shall be protected by conduit, capping or trunking of a suitable size. All external surface routes must be cleared with the *Builder* before installation.

Internal cables, located in building risers, must be fixed to a cable tray or located within an enclosed conduit or trunking.

Vertical spanned cables may be installed where cables are to be located on the outside of a building. Cables should be attached, as a harness, to a suitable catenary of galvanised or stainless steel catenary rope. Which in turn is fixed, by the use of U clamps, using a minimum of two clamps at each fixing point, at the top and bottom of each vertical span and tensioned to prevent displacement.

Where cables are run across a flat roof area, they should be installed on a suitable cable tray of galvanised material. The tray should be fixed, at not less than one metre spacing, to a heavy duty brick or concrete block, by means of a standard screw and plug fixing, two fixings to each brick or block. The brick or block should be laid on a non-penetrating membrane of rubber or on two layers of mineral roofing felt. The substance used should be cut to the size of the brick or block and loose laid on the existing roof surface. Care must be taken should any shingle be located on the roof that the placing of any Bricks or Blocks does not cause penetration of the existing roof surface. Alternatively, a proprietary support unit may be used in place of the brick or block, such unit to be approved by the [*Builder*], in writing prior to installation and installed to the manufacturer's instructions.

Cable trays that are fixed vertically should be fixed using a method that locates the tray against a vertical surface, with a minimum spacing off of that surface of 12mm, at no more than one metre spacing so that the tray does not move in any plane.

All cable trays must be earthed in line with the earthing statement of the IET so that the installation meets 17th (or later) edition regulations.

Overhead spans (of open public spaces) shall not be used unless no other route is available. Even then, they shall only be used with prior consent of the *Builder*. Allowance must be made for likely interference if this method is used.

The fibre installation can follow either a starwire design or one using Tree & Branch, whichever is best suited to the building.

All cabling within a property must adhere to the BS 7671:2008 - All new installations from the 1st July 2015 must comply with Amendment No. 3 to BS 7671:2008 which states -

- cabling or containment spanning 'escape routes' do not themselves cause a hazard by impeding access or egress due to collapse in extreme heat in the event of a fire.

Cables destined for one dwelling must not be routed through another dwelling. Should this be the only route of access available then the contractor must obtain written permission from the *Builder* prior to any work commencing.

Cables can only be installed in roof spaces where no other route exists.

Within systems all coaxial cables carrying the high bandwidth signals (0.95 – 5.45 GHz) should be connected with 50 ohm N-type connectors, and those carrying the lower frequencies up to 862 MHz should use 75 ohm F-connectors.

All fly leads will be 'Double Screened' and comply with the relevant parts of BS EN 60966-2-4:2009. Fly leads should be of a length to achieve a neat and tidy installation.

MOUNTING BOXES

Flush metal boxes shall comply with BS 4662:2006+A1:2009 and have a minimum internal depth of 40 mm. All cable exits from the boxes shall be grommeted so as to prevent damage to the cable. Flush mounted boxes of insulating material may be used in hollow partition walls of plasterboard and similar material and shall have a minimum internal depth of 40 mm, comply with BS5773 and have mounting centers compliant with BS 4662:2006+A1:2009.

In all cases, care shall be taken to ensure that all cable bending radii are no smaller than those advised by the coax and fibre cable manufacturers.

PASSIVE ACCESSORIES

All accessories must conform to the requirements of CENELEC BS EN 50083.

All passive accessories connected in the home shall be 75 ohms impedance, and where connected to the optical convertor output consideration must be given to the fact that in some instances the optical convertor may derive its power from the STB.

Within the headend the high frequency (0.95 – 5.45 GHz) stacked signals when carried over coax will use 50 ohm cables connected using N-connectors. The coax cables carrying the satellite IF and terrestrial signals will be 75 ohms and connected using F-connectors

Where not designed for outdoor use external equipment will be housed in suitable waterproof enclosures, conforming to a minimum IP55 specification. All external enclosures must be approved by the *Builder* prior to installation.

SOCKET OUTLETS

The fibre system should be connected to the optical convertor sited at a suitable point within the home / riser. Coaxial cables can then be run from the optical convertors outputs to the various outlet sockets within the premises as required. If more than two tuners are to be supported suitable dSCR multiswitches may be used to provide the additional feeds.

At least one socket outlet should be connected in every home. All socket outlets must be fully screened, surface or flush mount type, and have a minimum of four connecting points individual sockets shall be provided for TV, Satellite1, Satellite 2, (Sky+) and Audio (covering both FM and DAB frequencies). They must be approved for use on 'Sky Homes' installations. Where required, sockets must be capable of passing the Digibox infra-red remote control signals after output of optical convertor.

HOUSE DISTRIBUTION AMPLIFIERS.

Where slave RF outlets are installed then a House Distribution Amplifier should be used to take account of cable and splitting losses. Amplifier gain levels should not be excessive and should provide only enough gain to compensate for any cable, splitting and connection losses employed within the dwelling. The maximum and minimum signal levels previously noted in this document should be taken into account when planning extra outlets. Amplifiers must have a dc path between the Return Signal input and the outlet sockets to enable the use of “digilink” connections.

Amplifiers should be located in a dry secure location accessible for servicing and the location agreed with the *Builder* prior to installation.

If there is only one slave outlet installed then the amplifier may not be required and the Return Signal outlet may be connected directly to the extra outlet, ensuring a dc path between the two to enable the use of a “digilink” connection.

Cables should be routed, within the dwelling to a common, accessible, location so that servicing and future adaption can occur.

SAFETY

The total system must be installed to comply with the requirements of all relevant Health and Safety legislation and the safety statement as issued by the CAI.

All relevant equipment must be Safety Earth Bonded in compliance with BS EN 50083.

All cabling must comply with BS 7671:2008 – amendment 3 as specified in the cabling section above.

The external Aerial Mount should also be connected to the installations earth.

If a Lightning Protection System is installed on the given building then the aerial mount should be connected to the protective strip by use of proper LPS equipment.

Laser safety class 1 and class 1M. Safe for all conditions of normal use in compliance with IEC 60825 specification.

TEST OF THE INSTALLATIONS

Before the hand-over of each system and before completion of the contract, the whole system must be tested by the Contractor to ensure that the system complies fully with the Specification. The tests will include the optical power at the input to the optical convertor, the maximum and minimum signal levels and BER and MER quality measurements for each of the services, measured at the socket outlets as specified by the *Builder*. The Contractor shall provide a printed record of all measurements, either in tabulated or spectrum form, to Sky Homes and to the *Builder*, and shall also keep a set on file.

FINAL COMMISSIONING

The Contractor will have to supply a final commissioning certificate, indicating signals at the inputs and output of the main equipment and levels received at the outlets. The Contractor will have to demonstrate to the *Builder* that the digital TV channels are quasi error free (<1 error/hour).

The Contractor will provide all certification forms in a format provided by Sky Homes.

RF test equipment must be accurate to within +/- 1.5dB and suitable for all the services indicated. The minimum requirement is a Spectrum Analyser and an optical power meter. A simple RF signal strength indicator is not sufficient.

DEFECTS LIABILITY AND MAINTENANCE

The Contractor shall maintain the complete system to this Specification, without charge for a period of 12 months from the final date of commissioning. The date from which the warranty period will begin is the date of commissioning, which will be noted on the completion certificate.

The Contractor will attend to faults as reported by the *Builder* or occupier within 24 hours or as otherwise agreed in writing by all parties concerned.

All cables and equipment found to be faulty within the initial 12 month period will be repaired or replaced free of charge to the *Builder* and or purchaser/occupier.. If the fault is outside the control of the Contractor, the *Builder* and or purchaser/ occupier will accept a reasonable charge by the Contractor to rectify the fault.

MAINTENANCE CONTRACT

The Contractor shall provide with his tender a proposal for a maintenance contract for a given period of years or to be renewed yearly. This contract to pass to any subsequent Property Maintenance organisations or Residents Committees for discussion and agreement to proceed.

Appendix A

Recognised Manufacturer List

Digital Single Cable Routers (dscr)

(data sheets should be available for download from respective companies websites)

Unitron NV

Frankrijklaan 27
B-8970 Poperinge
Belgium

Tel: +3257333363

Email: sales@johansson.be

Website: www.johansson.be

Global Invacom

Winterdale Manor
Southminster Road
Althorne
Essex
CM3 6BX

Tel: 01621 743440

Email: sales@globalinvacom.com

Website: www.globalinvacom.com