



End-point assessment plan for Smart Home Technician apprenticeship standard

Apprenticeship standard reference number	Level of this end point assessment (EPA)	Integrated
ST0464	3	No

Contents

Introduction and overview	2
EPA summary table	3
Length of end-point assessment period:	4
Order of assessment methods	4
Gateway	5
Assessment methods.....	6
Grading.....	11
Roles and responsibilities	14
Internal Quality Assurance (IQA).....	16
Re-sits and re-takes.....	16
Affordability	16
Reasonable adjustments	17
Mapping of knowledge, skills and behaviours (KSBs)	18

Introduction and overview

This document sets out the requirements for end-point assessment (EPA) for the Smart Home Technician apprenticeship standard. It is for end-point assessment organisations (EPAOs) who need to know how EPA for this apprenticeship must operate. It will also be of interest to Smart Home Technician apprentices, their employers and training providers.

Full time apprentices will typically spend 18 months on-programme (before the gateway) working towards the occupational standard, with a minimum of 20% off-the-job training. All apprentices will spend a minimum of 12 months on-programme.

The EPA period should only start, and the EPA be arranged, once the employer is satisfied that the apprentice is consistently working at or above the level set out in the occupational standard, all of the pre-requisite gateway requirements for EPA have been met and that they can be evidenced to an EPAO.

All pre-requisites for EPA assessment methods must also be complete and available for the assessor as necessary.

The EPA must be completed within an EPA period lasting a maximum of 3 month(s), beginning when the apprentice has passed the EPA gateway.

The EPA consists of 3 discrete assessment methods.

The individual assessment methods will have the following grades:

Assessment method 1: Practical Test

- Pass
- Fail

Assessment method 2: Professional Discussion

- Pass
- Fail
- Distinction

Assessment method 3: Knowledge Test

- Pass
- Fail
- Distinction

Performance in the EPA will determine the overall apprenticeship standard and grade of:

- Pass
- Fail
- Distinction

EPA summary table

On-programme (typically 18 months)	Training to develop the occupation standard's knowledge, skills and behaviours.
End-point Assessment Gateway	Employer is satisfied the apprentice is consistently working at, or above, the level of the occupational standard. The apprentice must have achieved English and maths qualifications in line with the apprenticeship funding rules.
End Point Assessment (which would typically take 3 months)	Assessment Method 1: Practical Test Assessment Method 2: Professional Discussion Assessment Method 3: Knowledge Test

Length of end-point assessment period:

The EPA must be completed within an EPA period lasting a maximum of 3 month(s), beginning when the apprentice has passed the EPA gateway.

Order of assessment methods

The assessment methods can be delivered in any order.

Gateway

The EPA period should only start once the employer is satisfied that the apprentice is consistently working at or above the level set out in the occupational standard, that is to say they have achieved occupational competence. In making this decision, the employer may take advice from the apprentice's training provider(s), but the decision must ultimately be made solely by the employer.

In addition to the employer's confirmation that the apprentice is working at or above the level in the occupational standard, the apprentice must have completed the following gateway requirements prior to beginning EPA:

The apprentice must have achieved English and maths qualifications in line with the apprenticeship funding rules.

Assessment methods

Assessment Method 1: Practical Test (This Method has 2 components.)

Method 1 Component 1: TV and speaker installation - mechanical

Overview

Apprentices must be observed by an independent assessor completing a practical demonstration in which they will demonstrate the KSBs assigned to this assessment method. The end-point assessment organisation will arrange for the observation to take place, in consultation with the employer. Practical demonstrations must be carried out over a maximum total assessment time of 4 hour(s). The demonstrations may not be split, other than to allow comfort breaks as necessary. The assessor has the discretion to increase the time of the practical demonstration by up to 10% to allow the apprentice to complete the last task that is part of this element of the EPA.

The independent assessor may conduct and observe one apprentice at a time during this assessment method, due to the requirement to interact with the apprentice during the course of the assessment.

There may be breaks of 10 minutes during the practical assessment to allow the apprentice to move from one location to another.

Delivery

Apprentices must be provided with both written and verbal instructions on the tasks they must complete, including the timescales they are working to.

During the installation and when required, the assessor must act as the “second pair of hands” to assist with the lifting and positioning of hardware.

The following activities must be observed during the practical demonstration, that is a practical demonstration without these tasks would seriously hamper the opportunity for the apprentice to demonstrate occupational competence in the KSBs assigned to this assessment method.

- Interpret the job sheet and functional specification
- Read the drawings and verify the positions of the equipment
- Demonstrate health & safety and working in a clean environment
- Measure and cut speaker holes
- Measure and mount a TV wall bracket
- Install a TV
- Install a sound bar and front speakers
- Install an AVR and satellite box
- Install a mains extension
- Install HDMI cables
- Install network cables, switch and connect devices

KSBs observed must be documented by the independent assessor.

The independent assessor will make all grading decisions.

Resources development

EPAOs will produce specifications to outline in detail how the practical demonstrations will operate, what it will cover and what should be looked for. It is recommended that this be done in consultation

with employers. EPAOs should put measures and procedures in place to maintain the security and confidentiality of their specifications if employers are consulted. Specifications must be standardised by the EPAO.

Venue

Practical demonstrations must be conducted in one of the following locations:

- the employer's premises
- a suitable venue selected by the EPAO (e.g., a training provider's premises or another employer's premises)

The venue must provide the equipment to support the installation described above.

Support material

EPAOs will produce the following material to support this assessment method:

Outline of the assessment method's requirements

Marking materials

Method 1 Component 2: TV & speaker setup and commissioning

Overview

Apprentices must be observed by an independent assessor completing a practical demonstration in which they will demonstrate the KSBs assigned to this assessment method. The end-point assessment organisation will arrange for the observation to take place, in consultation with the employer. Practical demonstrations must be carried out over a maximum total assessment time of 2 hour(s). The demonstrations may not be split, other than to allow comfort breaks as necessary. The assessor has the discretion to increase the time of the practical demonstration by up to 10% to allow the apprentice to complete the last task that is part of this element of the EPA.

The independent assessor may conduct and observe only one apprentice during this assessment method, due to the requirement to interact with the apprentice during the course of the assessment.

Delivery

Apprentices must be provided with both written and verbal instructions on the tasks they must complete, including the timescales they are working to.

During this assessment and when required, the assessor must act as the client for the briefing and demo.

The following activities must be observed during the practical demonstration, that is a practical demonstration without these tasks would seriously hamper the opportunity for the apprentice to demonstrate occupational competence in the KSBs assigned to this assessment method.

- Interpret the job sheet and functional specification
- Switch on and check power to all devices
- Test internet access to all devices
- Test coaxial signals, TV and satellite
- Setup AVR including levels, delays, speaker types and input connections
- Test all audio outputs to speakers including ARC
- Test video sources to TV

- Configure Smart Apps on TV
- Connect smart device to music streamer
- Calibrate TV using test equipment
- Play demo film
- Brief the client
- Tidy the job site and remove all tools/waste/packaging

KSBs observed must be documented by the independent assessor.

The independent assessor will make all grading decisions.

Resources development

EPAOs will produce specifications to outline in detail how the practical demonstrations will operate, what it will cover and what should be looked for. It is recommended that this be done in consultation with employers. EPAOs should put measures and procedures in place to maintain the security and confidentiality of their specifications if employers are consulted. Specifications must be standardised by the EPAO.

Venue

Practical demonstrations must be conducted in one of the following locations:

- the employer's premises
- a suitable venue selected by the EPAO (e.g., a training provider's premises or another employer's premises)

The venue must provide the equipment to support the installation described above.

Support material

EPAOs will produce the following material to support this assessment method:

Outline of the assessment method's requirements

Marking materials

Assessment Method 2: Professional Discussion (This Method has 1 component.)

Overview

This assessment will take the form of a professional discussion, which must be appropriately structured to draw out the best of the apprentice's competence and excellence and cover the KSBs assigned to this assessment method. It will involve the questions that will focus on analysis of given scenarios, coverage of prior learning or activity, problem solving.

The professional discussion can take place in any of the following:

- a suitable venue selected by the EPAO (e.g., a training provider's premises)
- employer's premises

Delivery

The independent assessors will conduct and assess the professional discussion.

The professional discussion must last for 60 minutes and cover 8 questions, with follow-up questions if required. The independent assessor has the discretion to increase the time of the professional discussion by up to 10% to allow the apprentice to complete their last answer. Further time may be granted for apprentices with appropriate needs, for example where signing services are required.

During this method, the independent assessor must only use the EPAO's question bank.

The professional discussion will be conducted as set out here:

Video conferencing can be used to conduct the professional discussion, but the EPAO must have processes in place to verify the identity of the apprentice and ensure the apprentice is not being aided in some way.

The independent assessor must use the assessment tools and procedures that are set by the EPAO to record the professional discussion.

The independent assessor will make all grading decisions.

Venue

The professional discussion should take place in a quiet room, free from distractions and influence.

Other relevant information

A structured specification and question bank must be developed by EPAOs. The 'question bank' must be of sufficient size to prevent predictability and review it regularly (and at least once a year) to ensure that it, and its content, are fit for purpose. The specifications, including questions relating to the underpinning knowledge, skills and behaviours, must be varied yet allow assessment of the relevant KSBs.

EPAOs must ensure that apprentices have a different set of questions in the case of re-sits/re-takes.

Independent assessors must be developed and trained by the EPAO in the conduct of professional discussion and reaching consistent judgement.

EPAOs will produce the following material to support this assessment method:

Outline of the assessment method's requirements

Marking materials

Assessment Method 3: Knowledge Test (This Method has 1 component.)

Test Format

The test can be:

- computer based
- paper based

It will consist of 100 questions, in line with the industry-recognised Electronic Systems Certified Technician test. These questions will consist of closed response questions (e.g., multiple-choice questions).

Test administration

Apprentices must have a maximum of 120 minutes to complete the test.

The test is closed book which means that the apprentice cannot refer to reference books or materials.

Apprentices must take the test in a suitably controlled environment that is a quiet space, free of distractions and influence, in the presence of an invigilator. The invigilator may be the independent assessor, or another external person employed by the EPAO or specialised (proctor) software if the test can be taken on-line. The EPAO is required to have an invigilation policy that will set out how the test/examination is to be carried out. This will include specifying the most appropriate ratio of apprentices to invigilators to best take into account the setting and security required in administering the test/examination.

The EPAO is responsible for ensuring the security of testing they administer to ensure the test remains valid and reliable (this includes any arrangements made using online tools). The EPAO is responsible for verifying the validity of the identity of the person taking the test.

The EPAO must verify the suitability of the venue for taking the test and the identity of the person taking the test.

Marking

Tests must be marked by independent assessors or markers employed by the EPAO following a marking guide produced by the EPAO. Alternatively, marking by computer is permissible where question types allow this, to improve marking reliability.

Any incorrect or missing answers must be assigned 0 marks.

Question and resources development

Questions must be written by EPAOs and must be relevant to the occupation and employer settings. It is recommended that this be done in consultation with employers of this occupation. EPAOs should also maintain the security and confidentiality of their questions when consulting employers. EPAOs must develop 'question banks' of sufficient size to prevent predictability and review them regularly (and at least once a year) to ensure they, and the questions they contain, are fit for purpose. Predictability of questions may also be reduced by EPAOs must develop question banks of sufficient size to avoid predictability and refresh regularly.

Required supporting material

As a minimum EPAOs will produce the following material to support this method:

- A test specification
- sample tests and mark schemes
- live tests and mark schemes
- analysis reports which show areas of weakness for completed tests/exams and an invigilation policy.

Grading

Assessment method 1: Practical Test

KSBs	Fail	Pass
S1 S2 S3 S5 S8 S9 S10 S13 S14 S15 S16 B1 B3 B5 B6	Does not meet the pass criteria.	<p>Correctly follows relevant documentation, specification and drawings to complete the installations. (S1, S2)</p> <p>Complies with health and safety requirements; maintains a respectful and secure working environment at all times. (S3, B5, B6)</p> <p>Safely mounts hardware to specification, making modifications to existing construction where appropriate. (S10, S15)</p> <p>Correctly installs, configures, and troubleshoots basic calibration of home entertainment system. (S8, S9, S16)</p> <p>Identifies and uses the appropriate interconnecting leads. Installs and tests the interconnecting leads. Tests, fault-finds and troubleshoots cabling infrastructure, hardware, software and firmware. (S13, S14)</p> <p>Connects devices to a secure network. (S5)</p> <p>Communicates effectively using clear and concise language. (B1, B3)</p>

Assessment method 2: Professional Discussion

KSBs	Fail	Pass	Distinction
K4 S4 S6 S7 S11 S12 B1 B2 B3 B4 B7	Does not meet the pass criteria.	<p>Describes construction and electrical health and safety requirements and the steps to take to ensure personal safety and accident prevention.</p> <p>Describes the process of safe isolation and accessory replacement. (K4, S4)</p> <p>Demonstrates an awareness of the latest technology, legislation and regulations and how to apply them. (B4)</p> <p>Describes the process, and importance, of installing equipment ventilation, battery backup and other energy management systems. (S12)</p>	<p>(All must be achieved)</p> <p>Quotes specific standards when replying to questions (BS7671 and other relevant standards).</p> <p>Demonstrates an awareness of future technologies and how projects can be adapted to provide scope for accommodating them.</p> <p>Demonstrates understanding of British Thermal Units for heat calculation. Provides an example of the effects of heat buildup in systems and methods to mitigate these effects.</p>

		<p>Can describe the process of installation, configuration and testing of typical access control hardware, typical control hardware and communication devices. (S6, S7, S11)</p> <p>Communicates effectively and clearly displaying an awareness of organizational culture, ethics, local laws and directives. (B1, B2)</p> <p>Suggests workable solutions to meet customer needs. Able to work independently and take responsibility. (B3, B7)</p>	<p>Provides installation information to specific bus architectures.</p> <p>Understands when a change order is required to address mid-project changes and can explain the change order process.</p>
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Assessment method 3: Knowledge Test

The following grade boundaries apply to the test:

KSBs	Fail	Pass	Distinction
K1 K2 K3 K4 K5 K6 K7 K8 K9 K10 K11 K12 K13 K14 K15 K16 K17	A score of less than 70%	A score of 70-89%	A score of 90% or above

Overall EPA grading

All EPA methods must be passed for the EPA to be passed overall.

Apprentices must pass all three assessment methods to achieve an overall pass. In order to achieve a distinction, apprentices must achieve a distinction in both the professional discussion and knowledge test.

Grades from individual assessment methods should be combined in the following way to determine the grade of the EPA as a whole:

Practical	Professional Discussion	Knowledge Test	Overall grading
Pass	Distinction	Distinction	Distinction
Pass	Distinction	Pass	Pass
Pass	Pass	Distinction	Pass
Pass	Pass	Pass	Pass

Roles and responsibilities

Role	Responsibility
Apprentice	<ul style="list-style-type: none"> • participate in development opportunities to improve their knowledge skills and behaviours as outlined in the standard • meet all gateway requirements when advised by the employer • understand the purpose and importance of EPA and undertake EPA
Employer	<ul style="list-style-type: none"> • support the apprentice to achieve the KSBs outlined in the standard to their best ability • determines when the apprentice is working at or above the level outlined in the standard and is ready for EPA • select the EPAO • confirm all EPA gateway requirements have been met • confirm arrangements with EPAO for the EPA (who, when, where) in a timely manner • ensure apprentice is well prepared for the EPA
EPAO	<p>As a minimum EPAOs should:</p> <ul style="list-style-type: none"> • understand the occupational role • appoint administrators/invigilators and markers to administer/invigilate and mark the EPA • provide training and CPD to the independent assessors they employ to undertake the EPA • provide adequate information, advice and guidance documentation to enable apprentices, employers and providers to prepare for the EPA • deliver the end-point assessment outlined in this EPA plan in a timely manner • prepare and provide all required material and resources required for delivery of the EPA in-line with best practices • use appropriate assessment recording documentation to ensure a clear and auditable mechanism for providing assessment decision feedback to the apprentice • have no direct connection with the apprentice, their employer or training provider i.e., there must be no conflict of interest • maintain robust internal quality assurance (IQA) procedures and processes, and conducts these on a regular basis • conform to the requirements of the nominated external quality assurance body • organise standardisation events and activities in accordance with this plan's IQA section • organise and conduct moderation of independent assessors' marking in accordance with this plan • have, and operate, an appeals process • arrange for certification with the relevant training provider

Independent assessor	<p>As a minimum an Independent assessor should:</p> <ul style="list-style-type: none"> • understand the standard and assessment plan • deliver the end-point assessment in-line with the EPA plan • comply to the IQA requirements of the EPAO • be independent of the apprentice, their employer and training provider(s) i.e., there must be no conflict of interest • satisfy the criteria outlined in this EPA plan • hold or be working towards the Electronic Systems Certified Designer qualification • hold or be working towards an independent assessor qualification e.g. A1 and have had training from their EPAO in terms of good assessment practice, operating the assessment tools and grading • have the capability to assess the apprentice at this level • attend the required number of EPAOs standardisation and training events per year (as defined in the IQA section)
Training provider	<p>As a minimum the training provider should:</p> <ul style="list-style-type: none"> • work with the employer to ensure that the apprentice is given the opportunities to develop the KSBs outlined in the standard and monitor their progress during the on-programme period • advise the employer, upon request, on the apprentice's readiness for EPA prior to the gateway • Plays no part in the EPA itself

Internal Quality Assurance (IQA)

Internal quality assurance refers to the requirements that EPA organisations must have in place to ensure consistent (reliable) and accurate (valid) assessment decisions. EPA organisations for this EPA must:

- appoint independent assessors who have knowledge of designing, installing and/or managing installations
- appoint independent assessors who are competent to deliver the end-point assessment
- provide training for independent assessors in terms of good assessment practice, operating the assessment tools and grading
- have robust quality assurance systems and procedures that support fair, reliable and consistent assessment across the organisation and over time.
- operate induction training and standardisation events for independent assessors when they begin working for the EPAO on this standard and before they deliver an updated assessment method for the first time

Re-sits and re-takes

Apprentices who fail one or more assessment method will be offered the opportunity to take a re-sit or a re-take. A re-sit does not require further learning, whereas a re-take does.

Apprentices should have a supportive action plan to prepare for the re-sit or a re-take. The apprentice's employer will need to agree that either a re-sit or re-take is an appropriate course of action.

An apprentice who fails an assessment method, and therefore the EPA in the first instance, will be required to re-sit any failed assessment methods only.

Any assessment method re-sit or re-take must be taken during the maximum EPA period, otherwise the entire EPA must be taken again, unless in the opinion of the EPAO exceptional circumstances apply outside the control of the apprentice or their employer.

Re-sits and re-takes are not offered to apprentices wishing to move from pass to merit/distinction or merit to distinction.

Where any assessment method has to be re-sat or re-taken, the apprentice will be awarded a maximum EPA grade of pass, unless the EPAO determines there are exceptional circumstances requiring a re-sit or re-take.

Affordability

Affordability of the EPA will be aided by using at least some of the following practice:

- online testing
- using an employer's premises

Reasonable adjustments

The EPAO must have in place clear and fair arrangements for making reasonable adjustments for this apprenticeship standard. This should include how an apprentice qualifies for Reasonable Adjustment and what Reasonable Adjustments will be made. The adjustments must maintain the validity, reliability and integrity of the assessment methods outlined in this assessment plan.

Mapping of knowledge, skills and behaviours (KSBs)

Assessment method 1: Practical Test

Skills
S1 Using documentation keys, scales and revision numbers.
S2 Reading and following installation, architectural and project documentation.
S3 Following electrical and constructional health and safety procedures and policies for human safety and accident prevention.
S5 Connecting and configuring various network connected devices (e.g., typical domestic routers, network switches and wireless access points), securing a network using physical and cryptographic means.
S8 Installing, configuring, troubleshooting, maintaining and basic calibration of audio, video, and home entertainment systems.
S9 Installation and testing of terrestrial & satellite broadcast television, analogue and digital radio receivers.
S10 Placing and mounting typical hardware of all types listed within the individual subject areas of this standard.
S13 Installing and testing structured wiring systems using verification tools to PAS 35491.
S14 Testing, fault finding and troubleshooting cabling infrastructure, hardware, software, and firmware. Using applicable test equipment to check compliance with agreed specifications.
S15 Making modifications to existing construction (e.g., drilling, channelling, cable running, choosing and using appropriate anchoring devices).
S16 Troubleshooting basic systems to rectify simple faults.

Behaviours
B1 To make effective use of personal communication skills with colleagues, customers, third parties and associate companies using relevant, concise language in line with organisational culture.
B3 To be positive and pro-active at all times. Ability to work independently and take responsibility.
B5 Maintain a productive, professional, respectful and secure working environment when working alone or with others.
B6 Work in a healthy and safe manner and adhere to local rules and guidelines. Use resources wisely and take into account environmental, social and economic factors when working.

Assessment method 2: Professional Discussion

Knowledge
K4 Construction and electrical health and safety specific to personal safety and accident prevention. Includes Safe Isolation & Accessory Replacement.
Skills
S4 Safe isolation & accessory replacement.
S6 Installing and testing typical control hardware.
S7 Installation, configuration and testing of typical access control hardware.
S11 Installing, configuring and testing communication devices.
S12 Installing equipment ventilation and battery backup system (UPSs) and interfacing with HVAC and other energy management systems.

Behaviours
B1 To make effective use of personal communication skills with colleagues, customers, third parties and associate companies using relevant, concise language in line with organisational culture.
B2 To instigate, develop and maintain trust with colleagues, customers and related trades building credibility and confidence. To behave in an ethical manner and in accordance with local laws and directives.
B3 To be positive and pro-active at all times. Ability to work independently and take responsibility.
B4 To be ready to learn new skills, gain new knowledge and continually appraise new technologies. Be well-informed of new legislation/regulations and apply these correctly.
B7 Deliver excellent customer service, providing the right solutions to meet the customer's expectations within the agreed timeline.

Assessment method 3: Knowledge Test

Knowledge
K1 Technical drawings, product specifications, wiring schedules, testing specifications and schematics.
K2 Plans, elevations, cross-sectional drawings, isometrics, landscape drawings and Mechanical & Electrical drawings for other services.
K3 Project plans, works orders, change notes, purchase orders, sign-off sheets and performance / functional specifications.
K4 Construction and electrical health and safety specific to personal safety and accident prevention. Includes Safe Isolation & Accessory Replacement.
K5 Basic electrical theory (Ohms law, power law, series and parallel circuits, Inductance & capacitance), signal types and modulation methods.

K6 Network connected devices (e.g., typical domestic routers, network switches and wireless access points), basic network security and data protection.
K7 Control hardware (e.g., keypads, handsets, apps, control processors & interface standards) and building control systems (e.g., lighting control, HVAC control).
K8 Access control hardware e.g., CCTV cameras and recorders, door intercoms, access control keypads, locks and sensors).
K9 Audio, video and entertainment hardware, interfaces and content sources (e.g., speakers, amplifiers, processors, disc players, terrestrial & satellite broadcast television & radio, streaming devices, video displays, switching and distribution systems).
K10 Terrestrial & satellite broadcast television, analogue and digital radio receivers.
K11 Construction types, fixing methods, cable running, racks, brackets and other mounting hardware.
K12 Communication devices (e.g., telephones, smart phones, tablets, laptops, intercoms etc.)
K13 Environmental and energy management systems (e.g., HVAC, equipment ventilation and temperature / humidity control, smart meters, battery backup and power storage).
K14 Structured wiring and typical connectors used in smart home engineering to PAS 35491 (e.g., RJ series, coax connectors, HDMI and other AV types), wired Ethernet to IEEE 802.3 and wireless networks to IEEE 802.11.
K15 Applicable system specifications, standards, hardware, software, firmware and test equipment.
K16 Construction methods, project stages, MEP (Mechanical Electrical and Plumbing) materials, equipment & tools.
K17 Key job roles and responsibilities of associated trades, suppliers, customers and other officials.