



Australian Government

Department of Education, Employment and Workplace Relations

MEM21017A Service and repair clock timepieces

Release: 1

MEM21017A Service and repair clock timepieces

Modification History

Not Applicable

Unit Descriptor

Unit descriptor	This unit of competency covers servicing techniques for wall, floor or shelf clock timepieces that have a running time of eight days or thirty hours.
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Application of the Unit

Application of the unit	This unit of competency applies to clock repair work undertaken in clock service workshops. The unit does not cover servicing and repairs to complex clocks (e.g. clocks which are fitted with rack or count wheel striking mechanisms, complex escapements or oscillating mechanisms, rack or count wheel striking mechanisms, or clock chiming mechanisms). Where servicing or repairs are to be undertaken on these clocks or components appropriate higher level metal and engineering units should be selected. If after service and repair the clock is to be installed at the client's premises, <i>MEM21016A Install and set up clocks</i>, should be selected. Band: A Unit weight: 6 points
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Licensing/Regulatory Information

Not Applicable

Pre-Requisites

Prerequisite units		

Employability Skills Information

Employability skills	This unit contains employability skills.
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Elements and Performance Criteria Pre-Content

Elements describe the essential outcomes of a unit of competency.	Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.
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Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Establish servicing requirements and liaise with customer	1.1. Identify clock origin and case and movement construction and function 1.2. Verify clock condition and performance concerns with customer 1.3. Prepare written and verbal quotations 1.4. Agree with customer on recommended service procedures 1.5. Prepare clock for handover 1.6. Record and document repair process 1.7. Source replacement parts from industry suppliers
2. Disassemble clock, case and movement components for servicing	2.1. Establish appropriate working environment 2.2. Remove clock movements in sequence considering case design and construction 2.3. Select and correctly use appropriate hand and bench tools 2.4. Verify condition and completeness of clock case 2.5. Perform power release safely 2.6. Dismantle clock movement in correct sequence
3. Service and repair movement, sub-assemblies and components	3.1. Inspect movement, sub-assemblies and components, and identify condition and faults 3.2. Confirm servicing and repair requirements 3.3. Replace or repair faulty or worn component parts, movement or sub-assemblies 3.4. Use hand tools and equipment correctly for servicing and repair 3.5. Clean clock components at appropriate stages using cleaning and finishing methods 3.6. Verify condition of components after cleaning
4. Service clock cases	4.1. Verify completeness of clock case 4.2. Repair and replace missing or damaged components 4.3. Clean internals and refinish/refurbish exterior with appropriate materials and techniques
5. Reassemble clock movement and case components	5.1. Reassemble clock movement and case components 5.2. Assemble motion work and verify and adjust hand setting tension 5.3. Check and adjust component operations and clock functioning 5.4. Select and apply lubricants according to component

ELEMENT	PERFORMANCE CRITERIA
	design and estimated frictional load 5.5. Apply clock assembly inspections and precautions 5.6. Install and secure movement in case
6. Bench test and adjust clock functions	6.1. Verify/confirm function of clock movement 6.2. Set up, operate mechanical clock timing machine and interpret readings correctly 6.3. Verify clock performance and rate testing 6.4. Adjust rate according to performance and design characteristics
7. Apply industry workshop standards to perform work	7.1. Use hand tools and equipment safely and correctly 7.2. Handle components without damaging or marking 7.3. Establish a clean and safe work environment

Required Skills and Knowledge

REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

Required skills

Required skills include:

- identifying country of origin
- identifying various mechanical clocks by features, escapement and oscillator
- dismantling and reassembling clock assemblies and movements
- identifying and rectifying wear and faults in escapement, bearings, arbors, wheels and pinions
- replacing or repairing broken or damaged components
- safe handling of clock mainsprings, including using mainspring handling equipment
- correct lubrication including amount, type, cleanliness and point of application
- using service equipment (e.g. timing machine, cleaning machine, bushing tool, lathe)
- determining and calculating train counts, such as vibrations per hour (VPH)

Required knowledge

Required knowledge includes:

- types of mechanical clocks by country of origin, function, escapement, quality

REQUIRED SKILLS AND KNOWLEDGE

- function and operating principles of mechanical clocks
- dismantling and reassembling techniques of clock movements according to procedures and manufacturer guidelines
- clock cleaning methods
- procurement of replacement clock parts
- occupational health and safety (OHS) regulations and procedures

Evidence Guide

EVIDENCE GUIDE

The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

Overview of assessment

A person who demonstrates competency in this unit must be able to service and repair clock timepieces to industry standards, manufacturer specifications and in accordance with safety regulations and procedures.

Critical aspects for assessment and evidence required to demonstrate competency in this unit

Assessors must be satisfied that the candidate can competently and consistently:

- dismantle and reassemble clock movement and components
- safely remove and replace clock mainsprings
- repair and re-finish worn arbor pivots
- re-centre and replace worn bearings (re-bushing)
- safely clean clock components using appropriate methods and media
- apply lubrication techniques (e.g. correct type and amount)
- perform function and performance testing (e.g. adjust escapements, beat error and rate).

Context of and specific resources for assessment

- Assessment may occur on the job or in a simulated working environment. Access is required to real or appropriately simulated situations, including work areas, materials and equipment, and information on workplace practices and OHS practices.
- Where applicable, reasonable adjustment must be made to work environments and training situations to accommodate ethnicity, age, gender, demographics and disability.
- Access must be provided to appropriate learning and/or assessment support when required. Where applicable, physical resources should include equipment modified for people with disabilities.

Method of assessment

- Assessment must satisfy the endorsed Assessment Guidelines of the MEM05 Metal and Engineering Training Package.
- Assessment methods must confirm consistency and accuracy of performance (over time and in a range of workplace relevant contexts) together with application of underpinning knowledge.

EVIDENCE GUIDE	
	• Assessment methods must be by direct observation of tasks and include questioning on underpinning knowledge to ensure its correct interpretation and application. • Assessment may be applied under project-related conditions (real or simulated) and require evidence of process. • Assessment must confirm a reasonable inference that competency is not only able to be satisfied under the particular circumstance, but is able to be transferred to other circumstances. • Assessment may be in conjunction with assessment of other units of competency where required.
Guidance information for assessment	Assessment processes and techniques must be culturally appropriate and appropriate to the language and literacy capacity of the candidate and the work being performed.

Range Statement

RANGE STATEMENT	
The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.	
Clock origin, case and movement construction and function	Clock origin, case and movement construction and function may include: • clocks from all countries of manufacture • clocks manufactured during the 19th and 20th Centuries • clock cases made from timber, metal, natural stone and composite materials • movement components made from brass and steel • pendulum or balance oscillating systems • timepiece only mechanisms • motive force (e.g. mainspring or weight driven)

RANGE STATEMENT	
	• gear train for transmitting of power • escapement for release power • oscillator for controlling the speed of release of power • winding (e.g. by key) • time setting (e.g. by key or direct movement of hands)
Clock handover	Clock handover may include: • informing customer of features and characteristics of clock • demonstrating winding and setting procedures for clock • inform customer of operation and switching of any automatic night silent, or shut-off for chiming or striking mechanism • warranty information • date of installation
Record and document repair process	Record and document repair process may include: • extent and date of repair recorded • tracking of subcontractors • cost of replacement parts • time spent on procedure
Appropriate working environment	Appropriate working environment may include: • clean bench and working area • adequate lighting and ventilation • tools and equipment organised and in good condition • ergonomic seating, including bench height
Condition and faults	Condition and faults may include: • originality of components • corrosion • cleanliness • wear • damaged or failed components
Faulty or worn components	Faulty or worn components may include: • barrel and mainspring (e.g. hooking, teeth and bearings) • gear trains (e.g. bearings, pivots and pinions)

RANGE STATEMENT	
	- pendulum escapements (e.g. pallets and escape wheels engagement drop, locking and impulse) - oscillators pendulum type (e.g. rod, crutch engagement, suspension spring fittings and bob security) - oscillators balance type (e.g. balance spring, balance staff and roller) - winding mechanisms(e.g. key fitting, click, ratchet wheel and click spring) - setting hand tension or centre wheel friction
Hand tools and equipment	Hand tools and equipment may include: - clock repairers' hand tools (e.g. tweezers, screwdrivers and eyeglasses) - clock mainspring winder - clock re-bushing tool - reamers and smoothing broaches - lathe - oilstones and burnishers - movement supports for clock movements - oilers and oil pots - cleaning brushes, peg wood, solutions and rinses e.g. solvents - clock timing machine (this includes any type of machine that provides frequency count or indication of daily rate)
Cleaning and finishing	Cleaning and finishing may include: - hand cleaning - conventional machine (rotational) - ultrasonic - vibrational finishing and polishing - types of clock cleaning solutions - precautions for handling and disposing cleaning solutions - safe practices for the use of polishing equipment
Verify and adjust hand setting tension	Verify and adjust hand setting tension may include: test for correct friction (e.g. power to escape wheel)

RANGE STATEMENT	
	• adjustment of motion work friction
Select and apply lubricants	Select and apply lubricants may include: • correct lubricants for escapements, bearings, barrels and mainsprings • techniques for lubricating
Clock assembly inspections and precautions	Clock assembly inspections and precautions may include: • gear train end shake, backlash, lubrication • mainspring engagement, hooking, tension, lubrication • escapement operation, depthing, lubrication • pendulum oscillator (e.g. amplitude, crutch engagement and suspension function) • balance oscillators (e.g. end shake and balance spring condition, correct lubrication)
Performance and design characteristics	Performance and design characteristics may include: • source of motive force • escapement type • oscillator and pendulum construction
Clean and safe work environment	Clean and safe work environment may be specified through: • relevant legislation and regulations • enterprise operating procedures • 5S housekeeping related principles and procedures (e.g. sort, straighten, shine, standardise, sustain)

Unit Sector(s)

Unit sector	Horology
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Co-requisite units

Co-requisite units		

Competency field

Competency field	
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