ASSESSMENT GUIDE - 28965

DOMAIN	Refrigeration and Air Conditioning				
STANDARD	28965	V2	Maintain and service commercial RAC systems and equipment under supervision	Level 3	12 Credits
ENTRY	There are no pre-requisite unit standards. However, it is recommended that the learner holds unit **28960**: *Demonstrate knowledge of commercial RAC system maintenance and servicing*				

LEARNER TO COMPLETE	
Name	Company
NSI No.	Email / phone

Pre-assessment confirmation

I, the **learner**,

- Understand the assessment process and assessment requirements for this unit.
- Understand the appeals and resubmission processes.
- Believe I have the skills and knowledge to successfully complete the assessment requirements.

Assessment Submission: (Tick ✓ appropriate circle)	○	1st Submission	○	1st Resubmission	○	Final Resubmission

ASSESSOR TO COMPLETE	
Name	Company
Email / phone	

Pre-assessment confirmation

I, the assessor, can confirm the learner has achieved any pre-requisite requirements. ○

ASSESSOR: UPDATE RESULTS AND COMPLETE FEEDBACK ONLINE VIA CANVAS

NOTE TO LEARNER: You will be able to access your results via the Marks section (for this course) in Canvas. You will also see the feedback from your Assessor, and any actions you may need to take if a resubmission is required.

RESUBMISSIONS:

Under Apprentice Training New Zealand (ATNZ) policy you have a maximum of **two** resubmission opportunities for this assessment. In total you will have three opportunities to meet the unit standard requirements. Information about the ATNZ resubmission process can be found in the Learner Regulations.

APPEALS:

Your Assessor, Observer or Verifier will discuss ATNZ's Assessment Appeals process with you before carrying out this assessment. Information about the Assessment Appeals process can be found in the Learner Regulations.

LEARNER INSTRUCTIONS:

YOU WILL NEED TO BE ABLE TO:

- Prepare to maintain and/or service commercial RAC systems.
- Maintain and service RAC mechanical systems and components.
- Maintain and service RAC electrical and electronic systems and components.
- Retrofit refrigerants.
- Complete maintenance and servicing activities.

IMPORTANT INFORMATION

- Carefully read through this Assessment Guide so you know exactly what is expected.
- All evidence you provide for this assessment must be your own work.
- You must wear personal protection equipment (PPE) throughout the assessment
- Attach additional supporting evidence which shows you have the required skills and knowledge, e.g.
    - *Job sheets/ records of work carried out;*
    - *Service completion reports;*
    - *Changes to system specification,*
    - *Maintenance instructions, checklists*
    - *Work orders*
    - *Follow up actions*
    - *Photos / videos.*
- Clearly name and label all attached evidence. Labels for photos must describe the activity being performed in the photo and which job it relates to.

What you need to do		Tick when complete
Observation Checklist 1	1. You must be observed • Maintaining and/or servicing **THREE (3)** commercial RAC systems under supervision. This will include: ○ Preparation and planning activities ○ Maintaining and servicing mechanical systems & components. ○ Maintaining and servicing electrical and electronic systems & components ○ Completion and returning to service activities.	○
	2. You must also complete: • Practical Worksheet 1 • Practical Worksheet 2	○
	3. You must also upload **supporting evidence** from your THREE (3) jobs including job sheets that outline the requirements of the maintenance job, job completion reports, and before, during & after photos.	○
Observation Checklist 2	4. You must be observed • Repairing, adjusting and/or replacing components on ○ **TWO (2)** commercial RAC systems with **Mechanical faults** AND ○ **TWO (2)** commercial RAC systems with **Electrical system faults**.	○
	5. You must also complete • Practical Worksheet 3	○

	6. You must also upload **supporting evidence** from your FOUR (4) completed jobs including work orders, fault repair reports, and photos.	○
Observation Checklist 3	7. You are required to investigate suitability of commercial RAC system equipment for a retrofit and justify the change in terms of lifecycle cost and industry practice using Practical Worksheet 3 as a guide.	○
	8. You must be observed: • Recovering and storing existing refrigerant from a commercial RAC system under supervision. • Charge the commercial RAC system with alternative refrigerants and appropriate oils under supervision. • Amended the commercial RAC system labelling to reflect new refrigerant and oil under supervision.	○
	9. You must also upload **supporting evidence** from your completed job including reports, and before, during & after photos	○

Observation checklist 1 – Part A

(LEARNER TO COMPLETE THIS SECTION)

LEARNER INSTRUCTIONS:

- Carefully read through this Observation Checklist so you know exactly what is expected.
- You the learner must fill in **PART A**
- **PART B** will be completed by an observer who must be approved by your Assessor/Account Manager prior to starting this assessment.
- Your assessor may choose an observer from your workplace to observe and/or verify your work.

YOU MUST BE OBSERVED:

- Maintaining and or servicing **THREE (3)** commercial RAC systems under supervision. This will include:
  - Preparation and planning activities
  - Maintaining and servicing mechanical systems and components.
  - Maintaining and servicing electrical and electronic systems and components
  - Completion and returning to service activities.
- You may need to be observed more than once.
- Your Observer may ask you additional questions to check your knowledge and understanding.
- All work must be completed under supervision.
- Complete and attach **Practical Worksheet 1** - Visually inspect and clean/sanitise a RAC System
- Complete and attach **Practical Worksheet 2** - Perform an operational test on a RAC system
- Attach supporting evidence of for each maintenance/service job showing information about the job.

Learner name		**Workplace**	
Maintenance Job #	**Describe the Maintenance/Service Job. Include the name, make & model of commercial RAC system you worked on**	**Date completed**	**Supporting evidence attached**
Job 1			○
Job 2			○
Job 3			○

Observation checklist 1 – Part B –

(OBSERVER TO COMPLETE THIS SECTION)

- Watch the candidate carry out each task.
- Note down any extra questions you ask during the observation, and their response in the feedback section
- Make sure the candidate has attached any supporting documentation.
- For each statement below, tick if you agree.

Assessment Task		Job 1	Job 2	Job 3	PC
When preparing to maintain and/or service a commercial RAC system, the learner:					
1. Confirmed work to be carried out by reviewing maintenance plans and or service instructions.		○	○	○	PC 1.1
2. Established operational and performance parameters of the system based on specifications and/or drawings		○	○	○	PC 1.2
3. Coordinated any necessary work from other trades to meet the schedule and reduce downtime		○	○	○	PC 1.4
4. Gathered all necessary tools, equipment, materials, spare parts, and documentation to complete the job.		○	○	○	PC 1.3
5. In consultation with the supervisor, prepared the worksite area and RAC equipment for maintenance and servicing. Informed affected personnel		○	○	○	PC 1.5
When maintaining and servicing RAC mechanical, electrical and electronic systems and components, the learner:					
6. Conducted a visual inspection, cleaned/sanitised all RAC mechanical, electrical, and electronic systems and components	• Completed Practical Worksheet 1 - Visually inspect and clean/sanitise a RAC System, **including signatures**.	○	○	○	PC 2.1 PC 2.3 PC 3.1
7. Conducted an operational test to ensure that the system's mechanical, electrical, and electronic systems and components are operating correctly and efficiently.	• Completed Practical Worksheet 2 - Perform an operational test on a RAC system, **including signatures**. • Measured electrical quantities are in accordance with standard industry practices	○ ○	○ ○	○ ○	PC 2.1 PC 2.2 PC 3.1 PC 3.2
When completing maintenance and service activities, the learner:					
8. Confirmed tests are carried out and verified that the system meets specifications.		○	○	○	PC 5.2
9. Communicated identified issues or irregularities to the supervisor		○	○	○	PC 5.4
10. Documented findings in the maintenance log or inspection report		○	○	○	PC 5.5
11. Recommissioned the system according to procedure.		○	○	○	PC 5.1
12. Worksite and equipment are returned to operational state and affected personnel are notified		○	○	○	PC 5.3

Observer Name		Observer Signature		Date signed:

Observation Checklist 1 – Feedback

OBSERVER TO COMPLETE THIS SECTION

Job 1	Feedback from Observer
Please provide specific comments on the learner's ability to complete the job to specification.	

Job 2	Feedback from Observer
Please provide specific comments on the learner's ability to complete the job to specification.	

Job 3	Feedback from Observer
Please provide specific comments on the learner's ability to complete the job to specification.	

Practical Worksheet 1 (VISUALLY INSPECT AND CLEAN A RAC SYSTEM)

LEARNER TO COMPLETE

Fill in this worksheet while under supervision completing all THREE (3) maintenance/service jobs.

PC 2.1, 2.2, 2.3, 3.1

Assessment Task			Job 1	Job 2	Job 3
Inspect and clean RAC mechanical system components:					
Component Inspected		**Visually Check**	**Pass = ✓ OR Fail (Service) = X OR N/A**		
1.	Fans	No visible wear on blades, blades not wobbling, blades free of dust and debris.			
2.	Pumps	No visible fluid leaks			
3.	Compressors	No visible refrigerant leaks, proper oil levels, no visible oil leaks			
4.	Heat exchangers	No visible rust or corrosion, no visible fluid leaks, surfaces clean.			
5.	Filters	No visible dust or debris buildup, tears or holes			
6.	Valves	No visual refrigerant leaks or fluid leaks			
7.	Belts	No visual cracks, fraying, or slack			
8.	Shafts and axles	No scoring or deformation			
9.	Couplings	Proper alignment between connected components			
10.	Piping and tubing	No visual refrigerant leaks, water leaks, rust or damage			
11.	Ducting	No visual signs of air escaping, obstructions or damage, clean from dust and debris.			
12.	Doors, guards and latches	Close and latch properly, secure and undamaged, no visible wear on hinges and seals			
13.	Supporting structure and restraints	No visible signs of instability, damage, rust or wear.			
14.	Thermal insulation	No visible tears or missing sections, properly applied and intact.			
15.	Drains and trays	No visible obstructions, signs of water buildup or leakage.			
Inspect and clean RAC electrical system, electronics and components:					
Component Inspected		**Visually Check**	**Pass = ✓ OR Fail (Service) = X OR N/A**		
16.	Motors	No visible wear on motor housings and mounts, electrical connections are secure and free from corrosion, no signs of unusual noise or vibration.			
17.	Controllers	No housing cracks or damage, indicator lights are functioning correctly, all wire connections are tight and free of corrosion			

Assessment Task			Job 1	Job 2	Job 3
18.	Circuit breakers & fuses	All protective covers and enclosures are intact, reset buttons or switches are accessible and operable.			
19.	Wiring	No frayed or damaged insulation, wiring is neatly routed and secured, no signs of corrosion or looseness in connections.			
20.	Sensors	Correctly positioned, securely mounted, no damage or loose connections to sensor wiring, no dust and debris.			
21.	Thermostats	Display functioning correctly, verify settings are correct, thermostat responds to adjustments, no wear or looseness in wiring connections.			
22.	Relays	Contacts are clean, free from pitting or corrosion, securely mounted, relay coils are intact, no signs of burning,			
23.	Switches	Move freely, operate correctly, securely attached, contacts clean, corrosion-free.			
24.	Contactors	No visible wear, pitting, burnt, damaged, firmly mounted, connections secure			

Learners Name		Learners Signature		Date signed:

Practical Worksheet 2 (PERFORM AN OPERATIONAL TEST ON A RAC SYSTEM)

LEARNER TO COMPLETE

Fill in this worksheet while under supervision completing all THREE (3) maintenance/service jobs. Note readings and measurements where applicable.

PC 2.1, 2.2, 3.1, 3.2

Assessment Task			Job 1	Job 2	Job 3
Maintain RAC mechanical system components:					
Component Inspected		**Maintenance activity**	**Pass = ✓ OR Fail (Service) = X OR N/A**		
1.	Pumps	Water or refrigerant flow rate meets specifications, no cavitation or unusual noises, pump operates smoothly without excessive vibrations.	Note Measure	Note Measure	Note Measure
2.	Compressors	No unusual sounds or vibrations, unit does not get excessively hot, suction and discharge pressures within normal operating ranges.	Note Measure	Note Measure	Note Measure
3.	Heat exchangers	Temperature difference across the heat exchanger within specifications, fluid flow through the exchanger within specifications	Note Measure	Note Measure	Note Measure
4.	Filters	Do not restrict airflow, clean and in good condition			
5.	Valves	Valves open and close properly, no refrigerant or fluid leaks			
6.	Bearings	Smooth operation without play or noise			
7.	Pulleys and sheaves	In line and belt runs true without wobbling			
8.	Piping and tubing	Correct temperature along the piping, no signs of leakage.	Note Measure	Note Measure	Note Measure
9.	Controls and sensors	Sensors respond quickly and accurately, control settings result in the correct system responses.	Note Measure	Note Measure	Note Measure
10.	Refrigerant levels	Matches system's requirements, levels within specified range, in good condition, free from contaminants	Note Measure	Note Measure	Note Measure
11.	Lubricating oil	Compatible with refrigerant used, levels are adequate and within specified range, proper viscosity, not degraded, free from contaminants.			
12.	System performance	System maintains desired temperature without fluctuations, energy use aligns with expected efficiency, system's pressure within the recommended operating range.	Note Measure	Note Measure	Note Measure
Maintain RAC electrical system, electronics and components:					
Component Inspected		**Visually Check**	**Pass = ✓ OR Fail (Service) = X OR N/A**		
13.	Motors	Start and run smoothly, no unusual noises or vibrations			
		Measurements within specified limits for: • Voltage • Current and,	Note Measure	Note Measure	Note Measure

Assessment Task			Job 1	Job 2	Job 3
		• Insulation resistance			
14.	Controllers	Responds accurately to input commands, displays correct readings and stable.			
		Measurements within specified limits for: • Voltage • Current	Note Measure	Note Measure	Note Measure
15.	Circuit breakers & fuses	Test - activates correctly in fault conditions. Verify - resets properly after activation.			
		Measurements within specified limits for: • Continuity • Insulation resistance	Note Measure	Note Measure	Note Measure
16.	Wiring	All connections secure			
		Measurements within specified limits for: • Continuity • Insulation resistance • Voltage drop	Note Measure	Note Measure	Note Measure
17.	Sensors	Verify voltage and current - providing accurate readings, proper operation, respond quickly to changes in conditions.			
		Measurements within specified limits for: • Current • Voltage	Note Measure	Note Measure	Note Measure
18.	Thermostats	Maintains set temperature accurately Cycles the system on and off correctly			
		Measurements within specified limits for: • Continuity • Voltage	Note Measure	Note Measure	Note Measure
19.	Relays	Switches properly when activated, no damage			
		Measurements within specified limits for: • Continuity • Voltage • Current	Note Measure	Note Measure	Note Measure
20.	Switches	Operate smoothly, activate the correct functions Test switches multiple times - consistent operation			
		Measurements within specified limits for: • Continuity • Insulation resistance	Note Measure	Note Measure	Note Measure
21.	Contactors	Verify - engage and disengage correctly. No visible wear on the contacts.			

Learners Name		Learners Signature		

Observation checklist 2 – Part A

LEARNER TO COMPLETE THIS SECTION

LEARNER INSTRUCTIONS:

- Carefully read through this Observation Checklist so you know exactly what is expected.
- You the learner must fill in **PART A**
- **PART B** will be completed by an observer who must be approved by your Assessor/Account Manager prior to starting this assessment.
- Your assessor may choose an observer from your workplace to observe and/or verify your work.

YOU MUST BE OBSERVED:

- Repairing, adjusting and/or replacing components on
  - **TWO (2)** commercial RAC systems with **Mechanical faults** AND
  - **TWO (2)** commercial RAC systems with **Electrical system faults**.
- You may need to be observed more than once.
- Your Observer may ask you additional questions to check your knowledge and understanding.
- All work must be completed under supervision.
- Attach supporting evidence of for each maintenance/service job showing information about the job.

Learner name		**Workplace**	
Fault Job #	**Describe the Fault/Repair Job. Include the name, make & model of commercial RAC system you worked on**	**Date completed**	**Supporting evidence attached**
Mechanical Fault 1			○
Mechanical Fault 2			○
Electrical system Fault 1			○
Electrical System Fault 2			○

Observation checklist 2 – Part B

OBSERVER TO COMPLETE THIS SECTION

- Watch the candidate carry out each task.
- Note down any extra questions you ask of the candidate during the observation, and their response in the feedback section
- Make sure the candidate has attached any supporting documentation.
- For each statement below, tick if you agree.

Assessment Task	Mechanical Fault 1	Mechanical Fault 2	Electrical Fault 1	Electrical Fault 2	PC
When identifying and rectifying a fault, the learner:					
1. Diagnosed the fault in accordance with standard industry practices.	○	○	○	○	PC 2.4 PC 3.3
2. Discussed likely causes with Supervisor	○	○	○	○	PC 2.5 PC 3.4
3. Isolated power to the faulty component.	○	○	○	○	PC 2.6 PC 3.5
4. Carefully disassembled the component.	○	○	○	○	PC 2.6 PC 3.5
5. Confirmed the nature of the fault to the supervisor.	○	○	○	○	PC 2.6 PC 3.5
6. Repaired the fault by repairing, adjusting or replacing components	○	○	○	○	PC 2.6 PC 3.5
7. Reassembled component, ensuring it is properly aligned and secured.	○	○	○	○	PC 2.6 PC 3.5
8. Restored power and tests component operation and functionality under supervision.	○	○	○	○	PC 2.6 PC 3.5

Observer Name		Observer Signature		Date signed:

Observation Checklist 2 - Feedback

OBSERVER TO COMPLETE THIS SECTION

Mechanical Fault 1	Feedback from Observer
Please provide specific comments on the learner's ability to repair a mechanical fault.	

Mechanical Fault 2	Feedback from Observer
Please provide specific comments on the learner's ability to repair a mechanical fault.	

Electrical Fault 1	Feedback from Observer
Please provide specific comments on the learner's ability to repair an electrical fault.	

Electrical Fault 2	Feedback from Observer
Please provide specific comments on the learner's ability to repair an electrical fault.	

Any queries, email: canvas@atnz.org.nz ATNZ, Level 1, 19 Great South Road, Epsom 1051

Observation checklist 3 – Part A

LEARNER TO COMPLETE THIS SECTION

LEARNER INSTRUCTIONS:

- Carefully read through this Observation Checklist so you know exactly what is expected.
- You the learner must fill in **PART A**
- **PART B** will be completed by an observer who must be approved by your Assessor/Account Manager prior to starting this assessment.
- Your assessor may choose an observer from your workplace to observe and/or verify your work.

YOU MUST BE OBSERVED:

- Retrofitting refrigerant in a commercial RAC system. This includes:
  - Confirming the suitability of retrofitting the system using **Practical Worksheet 3.**
- Recovering and storing existing refrigerant and appropriate oils in accordance with industry practice.
  - Charging the system with alternative refrigerant in accordance with industry practice and manufacturers specifications.
  - Labelling the system to reflect the new refrigerant and oil in accordance with industry practice.
- You may need to be observed more than once.
- Your Observer may ask you additional questions to check your knowledge and understanding.
- All work must be completed under supervision.
- Attach supporting evidence of for each maintenance/service job showing information about the job.

Learner name		**Workplace**	
Describe the RAC System for which you replaced the refrigerant. Include the name, make & model of commercial RAC system you worked on.		**Date completed**	**Supporting evidence attached**
			○

Observation checklist 3 – Part B

(OBSERVER TO COMPLETE THIS SECTION)

For each statement below, tick if you agree.

Assessment Task	Task	PC
When retrofitting refrigerants in a commercial RAC system, the learner:		
1. Investigated the suitability of the equipment for retrofit and justified in terms of lifecycle cost and industry practice. **(Practical worksheet 3)**	○	PC 4.1
2. Recovered and stored existing refrigerant in accordance with standard industry practices.	○	PC 4.2
3. Charged systems with alternative refrigerants and appropriate oils in accordance with standard industry practice and manufacturers specifications.	○	PC 4.3
4. Amended system labelling to reflect new refrigerant and oil in accordance with standard industry practices.	○	PC 4.4

Observer Name		Observer Signature		Date signed:

Retrofitting refrigerant	Feedback from Observer
Please provide specific comments on the learner's ability to complete the tasks.	

Any queries, email: canvas@atnz.org.nz ATNZ, Level 1, 19 Great South Road, Epsom 1051

Practical Worksheet 3 (RETROFIT REFRIGERANTS)

PC 4.1

ANALYSIS QUESTIONS			Tick
Investigate the suitability of the commercial RAC equipment you have identified for retrofit of a new refrigerant. Use the following questions to help you investigate.			
What refrigerant is currently used in the RAC system?			○
What refrigerant will you use to retrofit RAC?			
Is the new refrigerant compatible with the existing system components?	Compressor		
	Expansion valve(s)		
	Heat exchangers		
Does the new refrigerant cause corrosion or degradation of system materials?			
Will the new refrigerant maintain or improve the system's efficiency?			
Can the new refrigerant handle the required cooling or heating load?			
Will the system components handle the pressure levels of the new refrigerant?			
What are the safety aspects of the new refrigerant, including its flammability and toxicity?			
Has a new refrigerant a lower ODP?			
Has a new refrigerant a lower GWP?			
Does the new refrigerant and retrofit process comply with relevant standards and regulations, such as AS/NZS 5149:2016 and AS/NZS 817:2016?			
What is the total lifecycle cost, including the cost of the refrigerant, retrofitting, and potential changes in energy consumption? How does this lifecycle cost compare to the current refrigerant lifecycle cost?	Initial refrigerant cost		
	Retrofitting costs		
	Annual energy cost		
	Total initial cost		
	Annual operating cost		
Is the system suitable for retrofitting? You MUST explain your conclusion.			