Apprenticeship and Certification Study Guide

Instrumentation and Control Technician

RSOS 2020

Newfoundland & Labrador

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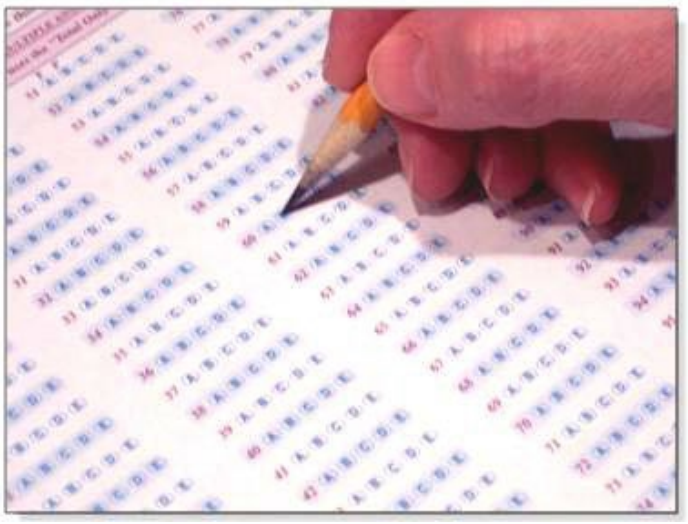
Introduction

This Study Guide has been developed by the Newfoundland and Labrador Department of Education and Early Childhood Development, Apprenticeship and Trades Certification Division, to assist apprentices and trade qualifiers as they prepare to write the Red Seal Exam. Red Seal Exams are available for all Red Seal trades. For a list of Red Seal trades please refer to the Department of Education and Early Childhood Development website: https://www.gov.nl.ca/atcd/designated-trades/list-of-designated-trades/

Some of the specific goals of this guide are:

- ⇨ to help you understand the skills and knowledge that might be covered on the exam
- ⇨ to help you identify your strengths and weaknesses
- ⇨ to provide organization and structure for a course of study
- ⇨ to provide a list of resources to help you with your study plan
- ⇨ to support and supplement the teaching and learning process

This study guide outlines the theoretical portion of the program. The intent is not to replace technical training provided under the guidance of instructors. Rather, it is a tool to be used in conjunction with formal training.



Exam Process

Before the Exam

You must contact the nearest Apprenticeship and Trades Certification Divisional office to make request to write the Red Seal exam (*See Appendix A for a list of regional offices*). Upon approval, the Apprenticeship Program Officer (APO) will notify you of your eligibility to write the exam, and provide you with scheduling information. If you require special accommodations due to a disability or language barrier, please contact your regional office for information on applying for this service.

During the Exam

You must bring:

- ☐ personal identification such as a photo or signature ID or valid Newfoundland and Labrador driver's license
- ☐ your notification letter

The following will be provided:

- ☐ a calculator (*see Appendix B for calculator information*)
- ☐ all other items required such as pencils, scrap paper, etc.

Important Note:

Personal cell phones, calculators, or other electronic equipment are NOT allowed into the exam room. If you do bring them, they will be stored away and returned to you when you have completed the exam.

After the Exam

Results will be mailed to you approximately seven to ten days after completion of the exam. All necessary instructions and information will be provided in the results letter.

The percentage mark you obtained will be provided. You will also be given a section by section breakdown, showing how many questions were in each section, as well as the number of questions in each section you completed successfully.

If you are successful in obtaining a 70% or more on your exam, you will be issued a Newfoundland and Labrador Certificate of Qualification with a Red Seal endorsement.

Exam Format

All Red Seal exams are written in multiple choice format. Each exam has between 100 and 150 questions. A multiple choice question consists of a stem (a complete question) followed by four options (A, B, C, D). The stem contains all the information necessary to answer the question. The options consist of the one correct answer and three "distracters." Distracters are incorrect. (*See Appendix C for a sample answer sheet*).

Red Seal exams contain three types of questions:

Level 1 Knowledge and Recall

Questions at this level test your ability to recall and understand definitions, facts, and principles.

Level 2 Procedural and Application

Questions at this level test your ability to apply your knowledge of procedures to a new situation.

Level 3 Critical Thinking

Questions at this level test your ability to interpret data, solve problems and arrive at valid conclusions.

Level 1 Examples:

1. When selecting a replacement component, which factor ensures that a conveyor electronic weigh scale will function properly?

   A. Maximum length of belt.
   B. Minimum width of belt.
   C. Average speed of belt.
   D. Sensor specifications.

2. Upon which principle of operation is a bulls-eye level gauge used on a steam boiler service based?

   A. Conductivity of water.

   B. Voltage change of thermocouple.

   C. Differing refractive indexes of steam and water.

   D. Resistance change of a resistance temperature detector.

3. Where is an intrinsic safety barrier panel installed?

   A. In a hazardous area with the ground bus bars returned to plant ground.

   B. In a safe area with no grounds.

   C. In a hazardous area with no grounds.

   D. In a safe area with an isolated ground.

Level 2 Examples:

1. When removing a 129 V DC explosion-proof instrument from service, which procedure would ensure equipment and personal safety?

   A. Lockout and tag, inform operations, open breaker, isolate from process.

   B. Lockout and tag, isolate from process, open breaker, inform operations.

   C. Inform operations, lockout and tag, open breaker, isolate from process.

   D. Inform operations, isolate from process, open breaker, lockout and tag.

2. While calibrating a variable speed drive, 10% input equals 15% speed, 50% input equals 55% speed and 90% input equals 95% speed. What type of error is indicated?

   A. Zero.
   B. Span.
   C. Angularity.
   D. Alignment.

3. Which types of transducers can be used to measure displacement or motion?

   A. LVDTs, piezoelectric, and variable resistance.
   B. LVDTs, variable resistance, and thermoelectric.
   C. Variable resistance, and thermoelectric.
   D. Thermoelectric, LVDTs, and sonic.

Level 3 Examples:

1. When installing a control valve on a steam process, which of the following valve ratings could be used? The process pressure is 1000 psi and 250°C.

   A. Valve rating 2000 psi, 100°C.
   B. Valve rating 500 psi, 500°C.
   C. Valve rating 1000 psi, 500°C.
   D. Valve rating 1000 psi, 150°C.

2. After replacing the speed-sensing probe, what is the probable cause of a 60 Hz reading being detected on the output signal of an induction-type speed sensor?

   A. The polarity is reversed.
   B. The terminals are corroded.
   C. The sensor is out of alignment.
   D. The shielding has not been properly grounded.

3. A nuclear density meter on an oil pipeline is showing erratic output. What is the probable fault?

   A. The scintillation counter is defective.
   B. The source has decayed.
   C. The shutter has been left practically closed.
   D. The source beam path is permanently obstructed.

Source of Questions*:*
https://www.red-seal.ca/eng/s.1mpl.2.2x.1mQ.5.2st.3.4ns.shtml?tid=130

Exam Content

Understanding the *Red Seal Occupational Standard* (RSOS)

The Red Seal model has historically been based on the development of the National Occupational Analysis (NOA) which supports the development of multiple-choice format examinations.

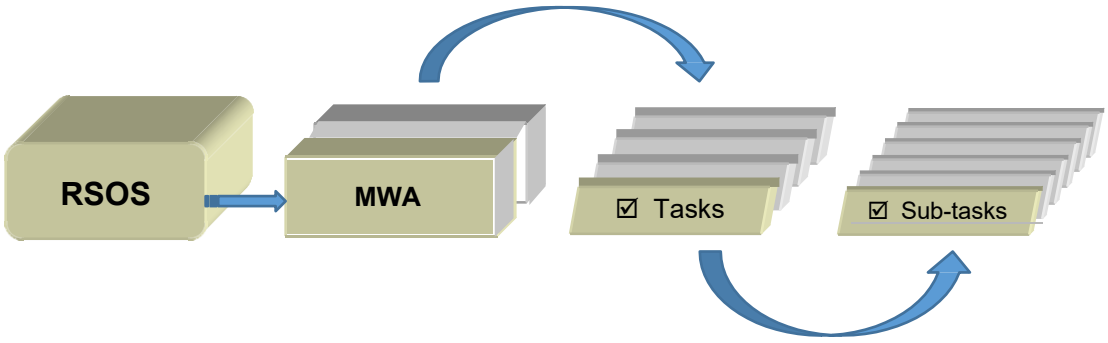
The RSOS was introduced in 2015 and is now taking the place of the NOA. Each RSOS or NOA sets the standard for a Red Seal trade. The Red Seal Examination is based on the Red Seal Standard.

The new standards provide greater consistency in learning resources and allow for increased industry involvement in the development of these standards. This new model places increases emphasis on apprenticeship training and assessing skills with industry learning objectives, outcomes and performance criteria.

The RSOS for each trade describes the tasks and sub-tasks; skills and knowledge requirements; summary of essential skills; safety information; trends affecting the trade; technical terms; names of tools and equipment; acronyms; learning objectives and outcomes; industry expected performance and essential skills related to each sub-task.

The RSOS is an excellent tool to use as you study for the Red Seal exam. RSOSs can be found at http://www.red-seal.ca/resources/n.4.1-eng.html

RSOS material is organized into the following categories: **MWA (***Major Working Activity***)**. The MWAs are further broken down into **TASKS** (*describes activities within an MWA*) and **SUB-TASKS (***describe activities within a task – This is what the exam is based on***)**.

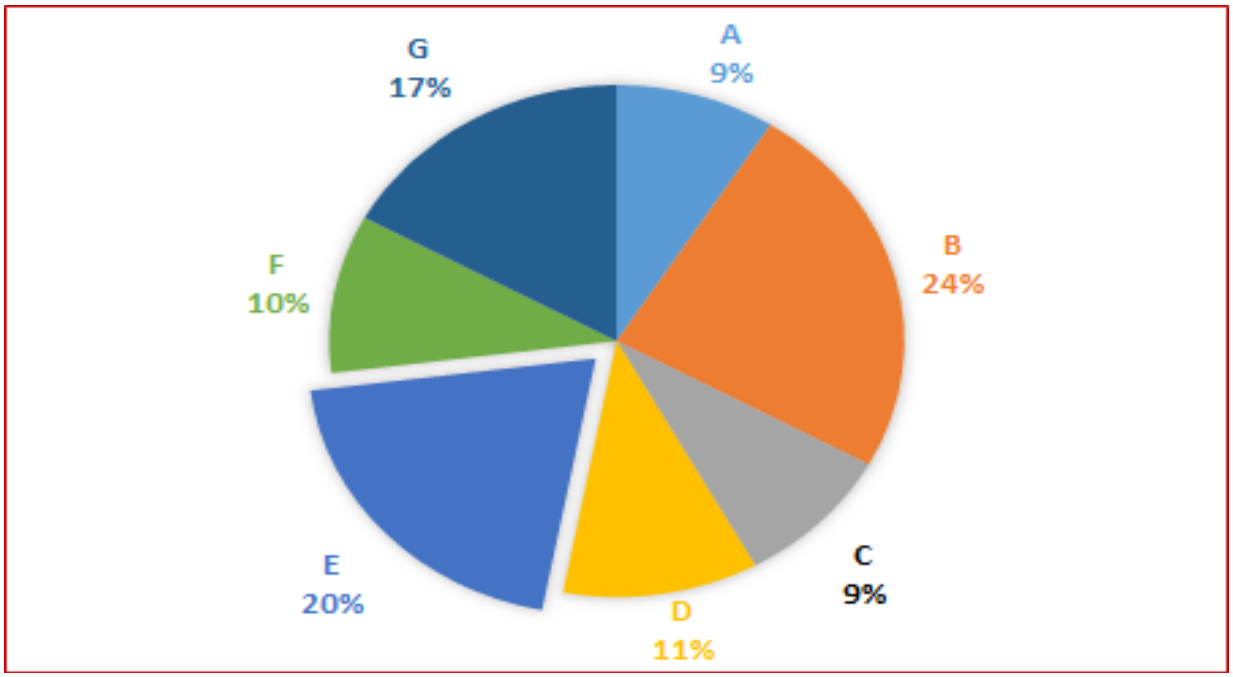


The NOA will continue to be used as the occupational standard for trades that do not yet have an RSOS developed.

RSOS Pie Chart

The RSOS Pie Chart presents the MWA percentages in the form of a pie chart which tells you the approximate number of questions from each MWA. For example, 9% of the questions on the **Instrumentation and Control Technician** Exam will be based on **MWA A**.

Instrumentation and Control Technician



MAJOR WORKING ACTIVITIES (MWA) Titles			
MWA A	Performs Common Occupational Skills	**MWA E**	Installs, Configures and Services Final Control Elements
MWA B	Installs and Services Process Measuring and Indicating Devices	**MWA F**	Installs and Services Communication Systems and Devices
MWA C	Installs and Services Safety and Security Systems and Devices	**MWA G**	Installs and Services Control Systems and Process Control
MWA D	Installs and Services Hydraulic, Pneumatic & Electrical Systems		

Exam Breakdown

The **Instrumentation and Control Technician** exam currently has 125 questions. The following table shows a breakdown of the number of questions that come from each RSOS MWA. It is important to note that the exact number of questions can change at any time. When you are ready to write your exam, you may contact your regional office to verify the number of questions (See Appendix A).

		# of Questions
MWA A	**Performs Common Occupational Skills**	**12**
Task 1	Performs safety-related functions	4
Task 2	Uses tools and equipment	4
Task 3	Organizes work	3
Task 4	Uses communication and mentoring techniques	1
MWA B	**Installs and Services Process Measuring and Indicating Devices**	**30**
Task 5	Installs and services pressure, temperature, level and flow devices	9
Task 6	Installs and services signal transducers	4
Task 7	Installs and services motion, speed, position and vibration devices	4
Task 8	Installs and services mass, density and consistency devices	4
Task 9	Installs and services process analyzers	5
Task 10	Installs and services multiple variable computing devices	4
MWA C	**Installs and Services Safety and Security Systems and Devices**	**11**
Task 11	Installs and services safety systems and devices	6
Task 12	Installs and services facility security systems. (**NOT COMMON CORE**)	N/A
Task 13	Installs and services safety instrumented systems (SISs)	5
MWA D	**Installs and Services Hydraulic, Pneumatic and Electrical Systems**	**14**
Task 14	Installs and services control devices for hydraulic systems	2
Task 15	Installs and services pneumatic equipment	6
Task 16	Installs and services electrical and electronic equipment	6
MWA E	**Installs, Configures and Services Final Control Elements**	**25**
Task 17	Installs and services valves	6
Task 18	Installs and services actuators	7
Task 19	Installs and services positioners	8
Task 20	Configures and services variable speed drives (VSDs)	4
MWA F	**Installs and Services Communication Systems and Devices**	**12**
Task 21	Installs and services control network systems	5
Task 22	Installs and services signal converters	4
Task 23	Installs and services gateways, bridges and media converters	3
MWA G	**Installs and Services Control Systems and Process Control**	**21**
Task 24	Establishes and optimizes process control strategies	5
Task 25	Installs and services stand-alone controllers (SACs)	3
Task 26	Installs and services programmable logic controllers (PLCs)	4
Task 27	Installs and services distributed control systems (DCSs)	4
Task 28	Installs and services human machine interface (HMI)	3
Task 29	Installs and services supervisory control and data acquisition (SCADA) systems	2
	Total	**125**

RSOS Sub-tasks

The following *RSOS Task Profile Checklist* outlines the MWAs, tasks and sub-tasks for your trade. The Red Seal exam is written to test your knowledge and abilities regarding the sub-tasks in the RSOS. This chart can be used to review your current knowledge. You can review by placing a checkmark (✓) next to those you understand fully.

Place your focus on those you do not understand and study them until you are comfortable with the material. Think of possible questions in that particular content area.

The RSOS also contains a list of "supporting knowledge and abilities" for each sub-task. They are the skills and knowledge you must have to perform a sub-task. The supporting knowledge and abilities identified under each sub-task will be very helpful as you review. The list can be found in the RSOS for your trade.

Task Profile Checklist
Based on RSOS 2020
Instrumentation and Control Technician

MWA A: Performs Common Occupational Skills

☐ **Task 1: Performs safety-related functions**

Sub-Tasks

- ☐ Maintains safe work environment.
- ☐ Uses personal protective equipment (PPE) and safety equipment
- ☐ Performs de-energizing, lock-out and tag-out procedures

☐ **Task 2: Uses tools and equipment**

Sub-Tasks

- ☐ Uses calibration, configuration and test equipment
- ☐ Uses hand and power tools
- ☐ Uses access equipment
- ☐ Uses rigging, hoisting and lifting equipment

☐ **Task 3: Organizes work**

Sub-Tasks

- ☐ Uses documentation
- ☐ Interprets drawings and schematics
- ☐ Plans tasks

☐ **Task 4: Uses communication and mentoring techniques**

Sub-Tasks

- ☐ Uses communication techniques
- ☐ Uses mentoring techniques

MWA B: Installs and Services Process Measuring and Indicating Devices

☐ **Task 5: Installs and services pressure, temperature, level and flow devices**

Sub-Tasks

- ☐ Installs pressure, temperature, level and flow devices
- ☐ Maintains pressure, temperature, level and flow devices
- ☐ Diagnoses pressure, temperature, level and flow devices
- ☐ Repairs pressure, temperature, level and flow devices

☐ **Task 6: Installs and services signal transducers**

Sub-Tasks

- ☐ Performs installation and configuration of signal transducers
- ☐ Diagnoses signal transducers
- ☐ Performs maintenance and repairs on signal transducers

MWA B: Installs and Services Process Measuring and Indicating Devices (Cont'd)

☐ **Task 7: Installs and services motion, speed, position and vibration devices**

Sub Tasks

- ☐ Installs motion, speed, position and vibration devices
- ☐ Maintains motion, speed, position and vibration devices
- ☐ Diagnoses motion, speed, position and vibration devices
- ☐ Repairs motion, speed, position and vibration devices

☐ **Task 8: Installs and services mass, density and consistency devices**

Sub-Tasks

- ☐ Installs mass, density and consistency devices
- ☐ Maintains mass, density and consistency devices
- ☐ Diagnoses mass, density and consistency devices
- ☐ Repairs mass, density and consistency devices

☐ **Task 9: Installs and services process analyzers**

Sub-Tasks

- ☐ Installs process analyzers
- ☐ Maintains process analyzers
- ☐ Diagnoses process analyzers
- ☐ Repairs process analyzers

☐ **Task 10: Installs and services multiple variable computing devices**

Sub Tasks

- ☐ Installs multiple variable computing devices
- ☐ Maintains multiple variable computing devices
- ☐ Diagnoses multiple variable computing devices
- ☐ Repairs multiple variable computing devices

MWA C: Installs and Services Safety and Security Systems and Devices

☐ **Task 11: Installs and services safety systems and devices**

Sub-Tasks

- ☐ Installs safety systems and devices
- ☐ Maintains safety systems and devices
- ☐ Diagnoses safety systems and devices
- ☐ Repairs safety systems and devices

☐ **Task 12: Installs and services facility security systems. (NOT COMMON CORE)**

Sub-Tasks

- ☐ Installs facility security systems. (NOT COMMON CORE)
- ☐ Maintains facility security systems. (NOT COMMON CORE)
- ☐ Diagnoses facility security systems. (NOT COMMON CORE)
- ☐ Repairs facility security systems. (NOT COMMON CORE)

☐ **Task 13: Installs and services safety instrumented systems (SISs)**

Sub-Tasks

- ☐ Installs SISs
- ☐ Configures SISs
- ☐ Maintains SISs
- ☐ Diagnoses SISs
- ☐ Repairs SISs

MWA D: Installs and Services Hydraulic, Pneumatic and Electrical Systems

☐ **Task 14: Installs and services control devices for hydraulic systems**

Sub-Tasks

- ☐ Installs control devices for hydraulic systems
- ☐ Diagnoses control devices for hydraulic systems
- ☐ Performs maintenance and repairs on control devices for hydraulic systems

☐ **Task 15: Installs and services pneumatic equipment**

Sub-Tasks

- ☐ Installs pneumatic equipment
- ☐ Diagnoses pneumatic equipment
- ☐ Performs maintenance and repairs on pneumatic equipment

☐ **Task 16: Installs and services electrical and electronic equipment**

Sub-Tasks

- ☐ Installs electrical and electronic equipment
- ☐ Diagnoses electrical and electronic equipment
- ☐ Performs maintenance and repairs for electrical and electronic equipment

MWA E: Installs, Configures and Services Final Control Elements

☐ **Task 17: Installs and services valves**

Sub-Tasks

- ☐ Installs valves
- ☐ Maintains valves
- ☐ Diagnoses valves
- ☐ Repairs valves

☐ **Task 18: Installs and services actuators**

Sub-Tasks

- ☐ Installs actuators
- ☐ Maintains actuators
- ☐ Diagnoses actuators
- ☐ Repairs actuators

MWA E: Final Control Devices (Cont'd)

☐ **Task 19: Installs and services positioners**

Sub-Tasks

- ☐ Installs positioners
- ☐ Maintains positioners
- ☐ Diagnoses positioners
- ☐ Repairs positioners

☐ **Task 20: Configures and services variable speed drives (VSD)s**

Sub-Tasks

- ☐ Configures VSDs
- ☐ Maintains VSDs
- ☐ Diagnoses VSDs
- ☐ Repairs VSDs

MWA F: Installs and Services Communications Systems and Devices

☐ **Task 21: Installs and services control network systems**

Sub-Tasks

- ☐ Performs installation and configuration on control network systems
- ☐ Diagnoses control network systems
- ☐ Performs maintenance and repairs on control network systems

☐ **Task 22: Installs and services signal converters**

Sub-Tasks

- ☐ Performs installation and configuration of signal converters
- ☐ Diagnoses signal converters
- ☐ Performs maintenance and repairs on signal converters

☐ **Task 23: Installs and services gateways, bridges and media converters**

Sub-Tasks

- ☐ Performs installation and configuration of gateways, bridges and media converters
- ☐ Diagnoses gateways, bridges and media converters
- ☐ Performs maintenance and repairs on gateways, bridges and media converters

MWA G: Installs and Services Control Systems and Process Control

☐ **Task 24: Establishes and optimizes process control strategies**

Sub-Tasks

- ☐ Determines process control strategy
- ☐ Optimizes process control

☐ **Task 25: Installs and services stand-alone controllers (SACs)**

Sub-Tasks

- ☐ Installs SACs
- ☐ Configures SACs
- ☐ Performs maintenance, diagnostics and repairs on SACs

☐ **Task 26: Installs and services programmable logic controllers (PLCs)**

Sub-Tasks

- ☐ Installs PLCs
- ☐ Configures PLCs
- ☐ Performs maintenance, diagnostics and repairs on PLCs

☐ **Task 27: Installs and services distributed control systems (DCSs)**

Sub-Tasks

- ☐ Installs DCSs
- ☐ Configures DCSs
- ☐ Performs maintenance, diagnostics and repairs on DCSs

☐ **Task 28: Installs and services human machine interfaces (HMIs)**

Sub-Tasks

- ☐ Installs HMIs
- ☐ Configures HMIs
- ☐ Performs maintenance, diagnostics and repairs on HMIs

☐ **Task 29: Installs and services supervisory control and data acquisition (SCADA) systems**

Sub-Tasks

- ☐ Installs SCADA systems
- ☐ Configures SCADA systems
- ☐ Performs maintenance, diagnostics and repairs on SCADA systems

Create a Study Plan

As you prepare for your exam, it is important to plan a schedule. The following two tables will help you stay on track.

The first table is a **"Weekly Study Plan."** In this table list the areas you will focus your study for each day. You should include items you need to review as well as items you need to study. Remember, more time will be needed for study in areas you find difficult, whereas you may only require review in areas you are more familiar with. As you work through the RSOS sub-task list you can start to fill in this table.

The second table is a **"Study Time Table."** It is important to create a study schedule where you determine the best days of the week and times of day for you to study.

Print several copies of these tables and fill out for each week of study. It is important to stick to your study schedule.

Weekly Study Plan for Week of: _____

	Area of Study 1	Area of Study 2	Area of Study 3	Area of Study 4	Area of Study 5	Area of Study 6
Mon.						
Tues.						
Wed.						
Thu.						
Fri.						
Sat.						
Sun.						

Study Time Table for Week of: _____

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
8:00 AM - 9:00 AM							
9:00 AM - 10:00 AM							
10:00 AM - 11:00 AM							
11:00 AM - 12:00 Noon							
12:00 Noon 1:00 PM							
1:00 PM - 2:00 PM							
2:00 PM - 3:00 PM							
3:00 PM - 4:00 PM							
4:00 PM - 5:00 PM							
5:00 PM - 6:00 PM							
6:00 PM - 7:00 PM							
7:00 PM - 8:00 PM							

Resources - Websites

Study information can be drawn from a variety of sources. A sample list of study materials (websites and books) is provided below. These and other helpful resources may be found in a local college bookstore, on the internet, or at your place of employment. You may also be able to borrow them from an apprentice or journeyperson in your trade.

Study Strategies and Exam Preparation Guide

The *Study Strategies & Exam Preparation Guide* is meant to be used in conjunction with this study guide. It provides direction and information on such areas as study habits, test preparation and test taking techniques.

https://www.gov.nl.ca/atcd/files/Study-Strategies-and-Exam-Prep-Guide-October-2023.pdf

Plan of Training (POT)

A *Provincial Plan of Training* details the full scope of learning for a particular occupation, including both technical training competencies and industry experiences necessary to write a Red Seal exam (and complete the requirements for Red Seal Certification), or to write a provincial examination. The Plan of Training is based on the RSOS.

https://www.gov.nl.ca/atcd/designated-trades/pots-aacs/

Red Seal Website

Red Seal is a program that sets common standards to evaluate the skills of tradespeople across Canada. It is a partnership between the Federal Government and the provinces/territories.

The Red Seal model has been based on the National Occupational Analyses (NOA), which supports the development of multiple-choice examinations. A **new** Red Seal Occupational Standard (RSOS) was introduced in 2015 and is taking the place of the NOA.

https://www.red-seal.ca/

Instrumentation and Control Technician PRACTICE Exam

This is **NOT** a Red Seal exam. This is a practice exam provided by the Red Seal Standards Program. It was developed using similar question types to that of a Red Seal exam. The exam is intended to be used for self-assessment in preparation for writing a Red Seal Exam.

https://www.red-seal.ca/eng/s.1mpl.2.2x.1mQ.5.2st.3.4ns.shtml?tid=130

Red Seal Exam Self-Assessment Guide

Use this self-assessment tool to rate your own understanding and experience with the tasks of the trade that are on the Red Seal examination:

https://www.red-seal.ca/eng/resources/selfexamspace.shtml?tid=130

Acronyms

The Red Seal website lists Acronyms which will be helpful in preparing for your Red Seal exam:

https://red-seal.ca/eng/trades/instrumentcntltech/app-a.shtml

Tools and Equipment

The Red Seal website lists Tools and Equipment which will be helpful in preparing for your Red Seal exam:

https://red-seal.ca/eng/trades/instrumentcntltech/app-b.shtml

Glossary

The Red Seal website also shows a Glossary which is helpful in preparing for the Red Seal exam:

https://red-seal.ca/eng/trades/instrumentcntltech/app-c.shtml

Resources – Book List

The books listed below are sorted according to RSOS MWAs as referenced throughout this study guide. You can use this list to help you obtain information on specific topics. It is not necessary to use these books specifically, as you may find others that will be equally beneficial.

BOOK	A	B	C	D	E	F	G
Delmar's Standard Text of Electricity, 4th Ed.	✓			✓			
Process Measurement and Analysis		✓	✓		✓	✓	✓
Process Control and Optimization		✓	✓		✓	✓	✓
Measurement and Control Basics		✓	✓		✓	✓	✓
Instrumentation, 4th Ed.		✓	✓		✓	✓	✓
Canadian Electrical Code	✓					✓	
CE Code Pocket Reference	✓					✓	
Hand Tools for Instrumentation – Module 12101-01	✓						
Power Tools for Instrumentation – Module 12103-01	✓						
Fasteners – Module 12103-01	✓						
Filters, Regulators, and Dryers – Module 12210-03				✓			
Clean, Purge, and Test Tubing and Piping Systems – Module 12303-03				✓			
Grounding and Shielding of Instrumentation Wiring – Module 12306-03						✓	
Terminating Conductors – Module 12307-03						✓	
Troubleshooting and Commissioning a Loop – Module 12404-03	✓				✓		
Performing Loop Checks – Module 12403-03	✓				✓		
Tuning Loops – Module 12405-03	✓				✓		
Tubing – Module 12111-01				✓			

If you wish to obtain any of the resources listed above, here is the reference information:

- ☐ *Delmar's Standard Text of Electricity,* 4th edition, Delmar Publishers, 2008, Herman, S., ISBN 978-1418065805
- ☐ *Process Measurement and Analysis*, Instrument Engineers' Handbook*,* 4th Edition, 2003, Liptak, B.G., ISA. ISBN 0-8493-1083-0
- ☐ *Process Control and Optimization*, Instrument Engineers' Handbook, 4th Edition, 2006, Liptak, B.G., ISA. ISBN 0-8493-1081-4
- ☐ *Measurement and Control Basics*, 4th Edition, 2007, Hughes, T.A., ISA. ISBN 978-1-55617-916-7
- ☐ *Instrumentation*, 4th Edition, 2005, ISBN 978-0-8269-3423-9
- ☐ *Instrumentation Workbook,* 4th Edition, 2005. ISBN 978-0-8269-3424-6
- ☐ *Canadian Electrical Code, Part 1* (Safety Standard to Electrical Installations), 2009, CSA. ISBN 978-1-55436-473-2

Resources – Book List (Continued)

- ☐ *CE Code Pocket Reference* (Safety Standard for Electrical Installations), 2009, CSA. ISBN 978-1-55491-046-5
- ☐ *Hand Tools for Instrumentation*, Module 12101-01, 2001, NCCER (National Center for Construction Education and Research Module). ISBN 0-13-868167-8
- ☐ *Power Tools for Instrumentation,* Module 12103-01, 2001, NCCER (National Center for Construction Education and Research Module). ISBN 0-13-868225-9
- ☐ *Fasteners,* Module 12106-01, NCCER (National Center for Construction Education and Research Module). ISBN 0-13-868324-7
- ☐ *Filters, Regulators, and* Dryers, Module 12210-03, 2001, NCCER (National Center for Construction Education and Research Module). ISBN 0-13-103274-7
- ☐ *Clean, Purge, and Test Tubing and Piping* Systems, Module 12303-03, 2001, NCCER (National Center for Construction Education and Research Module). ISBN 0-13-103298-4
- ☐ *Grounding and Shielding of Instrumentation* Wiring, Module 12306-03, 2001, NCCER (National Center for Construction Education and Research Module). ISBN 0-13-103302-6
- ☐ *Terminating* Conductors, Module 12307-03, 2001, NCCER (National Center for Construction Education and Research Module). ISBN 0-13-103303-4
- ☐ *Troubleshooting and Commissioning a* Loop, Module 12404-03, 2001, NCCER (National Center for Construction Education and Research Module). ISBN 0-13-109614-1
- ☐ *Performing Loop* Checks, Module 12303-03, 2001, NCCER (National Center for Construction Education and Research Module). ISBN 0-13-109613-3
- ☐ *Tuning* Loops, Module 12405-03, 2001, NCCER (National Center for Construction Education and Research Module). ISBN 0-13-109613-3
- ☐ *Tubing*, Module 12111-01, 2001, NCCER (National Center for Construction Education and Research Module).

Disclaimer

Various external resources (websites, textbooks) have been listed in this study guide to assist an individual in preparing to write a Red Seal Exam. This does not mean the Department of Education and Early Childhood Development, Newfoundland and Labrador endorses the material or that these are recommended as the best resources. There may be other resources of equal or greater value to an individual preparing for a Red Seal exam. The Department of Education and Early Childhood Development has no control over the content of external textbooks and websites listed, and no responsibility is assumed for the accuracy of the material.

Conclusion

We hope this guide has provided you with some useful tools as you prepare for your Red Seal exam. If you have any questions regarding your Red Seal exam please contact your regional office (*see Appendix A for a list of regional offices*).

We appreciate your comments and feedback regarding the usefulness of this study guide. If you have any comments or suggestions, we welcome your feedback. The feedback form at the end of this guide can be used for this purpose.

Appendix A: Regional Offices

If you have any questions regarding your Red Seal exam, please contact one of the following regional offices:

Department of Education and Early Childhood Development
Apprenticeship and Trades Certification Division
Toll Free: 1-877-771-3737
https://www.gov.nl.ca/atcd/contact-us/staff-listing-and-office-locations/

Corner Brook

1-3 Union Street
Aylward Building, 2nd Floor
Corner Brook, NL A2H 5M7

Telephone: (709) 637-2366
Facsimile: (709) 637-2519

Grand Falls-Windsor

42 Hardy Avenue
Grand Falls-Windsor, NL
A2A 2J9

Telephone: (709) 292-4215
Facsimile: (709) 292-4502

Clarenville

45 Tilley's Road
Clarenville, NL
A5A 1Z4

Telephone: (709) 466-3982
Facsimile: (709) 466-3987

St. John's

P.O. Box 8700
1170 Topsail Road
Mount Pearl, NL A1B 4J6

Telephone: (709) 729-2729
Facsimile: (709) 729-5878

Happy Valley-Goose Bay

163 Hamilton River Road
Bursey Building
Happy Valley-Goose Bay, NL
A0P 1E0

Telephone: (709) 896-6348
Facsimile: (709) 896-3733

Wabush

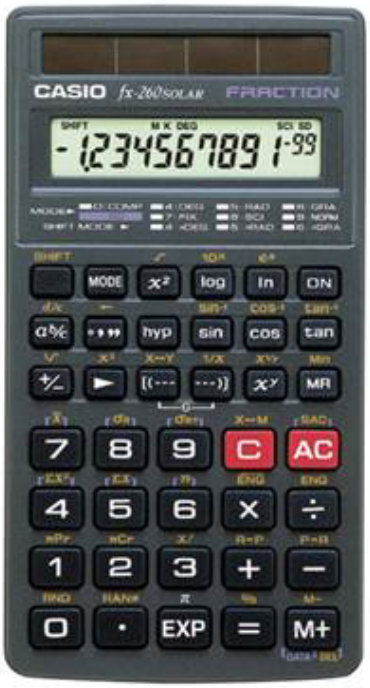
1D Grenfell Drive
P.O Box 160
Wabush, NL
A0R 1B0

Telephone: (879) 382-1920
Facsimile: (709) 282-3007

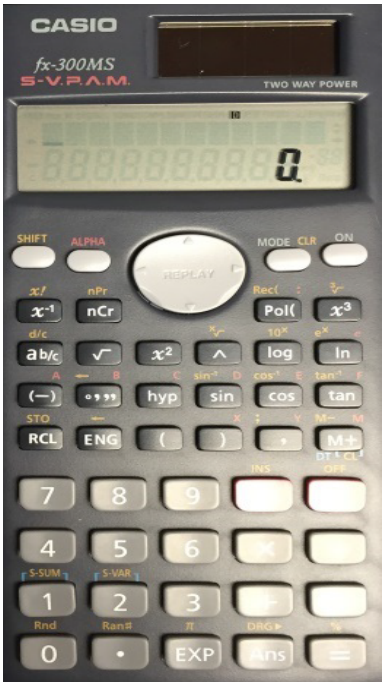
Appendix B: Calculator Use

The picture below shows a calculator with the same functions as the one you will be provided with during your exam. It is advisable to borrow or purchase one with similar functions so that you can familiarize yourself with it before you write your exam.

Casio FX-260

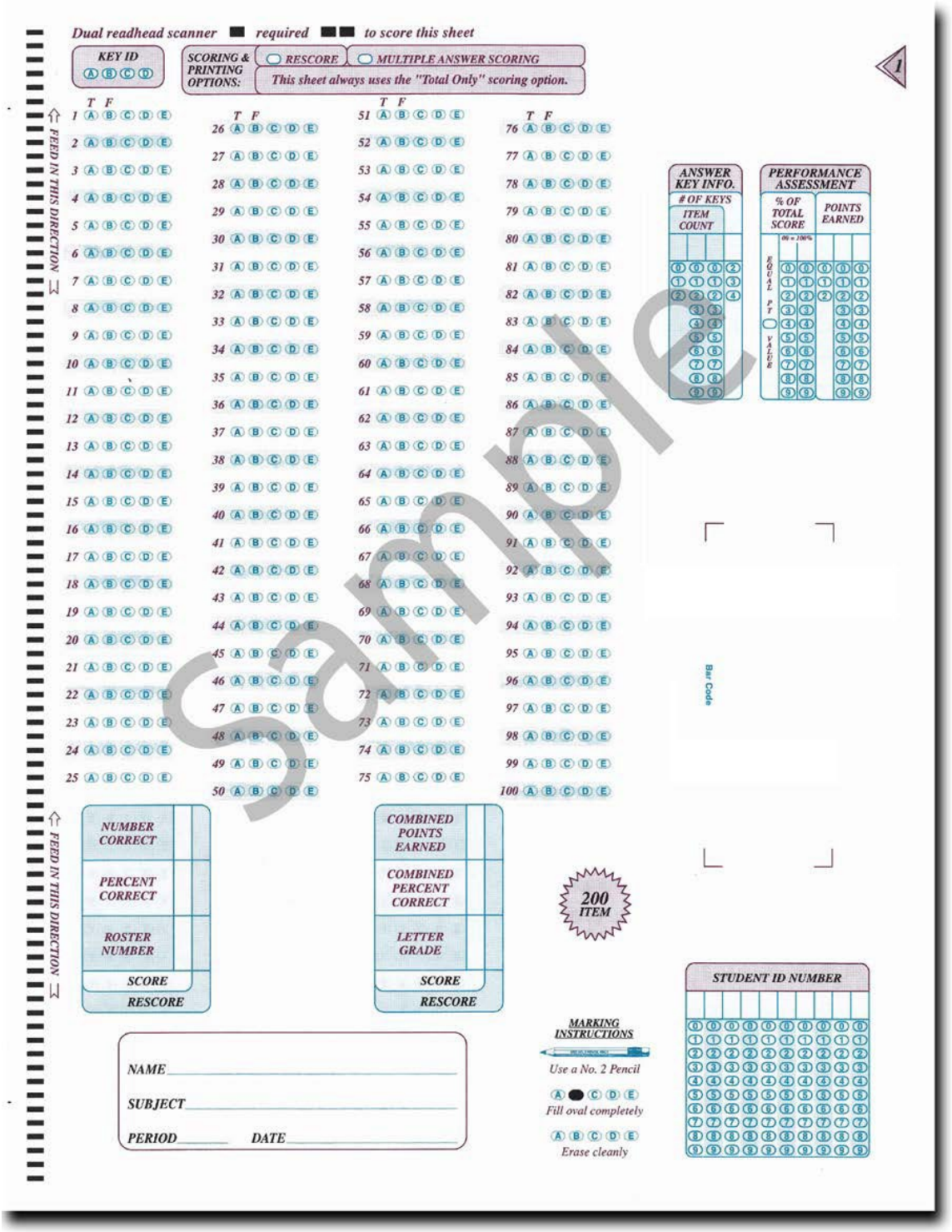


Casio FX-300 MS



Appendix C: Answer Sheet Example

With your exam you will be given an answer sheet similar to the one below. When answering multiple choice questions be sure to fill the circle completely and fill the circle that corresponds to the question on the exam.



Feedback Form
Study Guide – Instrumentation and Control Technician

Please answer the following:

(1) This Study Guide is a useful tool for exam preparation.
☐ strongly agree ☐ agree ☐ disagree ☐ strongly disagree

(2) The topics contained in the guide are arranged in a logical order.
☐ strongly agree ☐ agree ☐ disagree ☐ strongly disagree

(3) The design and format of the guide caught my attention.
☐ strongly agree ☐ agree ☐ disagree ☐ strongly disagree

(4) The instructions throughout the guide are clear and to the point.
☐ strongly agree ☐ agree ☐ disagree ☐ strongly disagree

(5) The resources listed in this guide are suitable and valuable.
☐ strongly agree ☐ agree ☐ disagree ☐ strongly disagree

(6) The guide should contain more information.
☐ strongly agree ☐ agree ☐ disagree ☐ strongly disagree

Suggested information/resources to include:

Additional Comments:

Please complete this form and return via fax or mail to the following:

Department of Education and Early Childhood Development
Apprenticeship and Trades Certification Division
Standards and Curriculum Unit
45 Tilley's Road, Clarenville, NL A5A 1Z4
Fax: (709) 466-3987

Department of Education and Early Childhood Development
Apprenticeship and Trades Certification Division

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