# Procedures

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| Category: **ELECTRICITY** | Procedure: **P-E-04 (rev. 1)** | Page: **1 of 14** |
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| | Supersedes: **P-E-04** | |

**Generic procedures for conducting installation verifications of multiple customer metering systems**

## 1.0 Background

The initial installation verification of all multiple customer metering systems (MCMSs) are required to be inspected concurrently with the commissioning process where possible, but no later than one year from the date that the system is activated, in accordance with section 7.2 of S-E-04.

## 2.0 Purpose

This document is intended to provide generic procedures for Measurement Canada inspectors to perform inspections of MCMSs, where device specific procedures are not available.

## 3.0 Scope

These procedures apply to all MCMSs, including those which use separately approved instrument transformers and are being used for the purpose of obtaining the basis of a charge for electricity in Canada.

## 4.0 Definitions

**Commissioning**
The process or procedure used during installation of multiple customer metering systems prior to activation to ensure the system is operating correctly. (For example, the process for assessing that current sensors or instrument transformers are connected to the correct load and associated with the applicable voltage connections.)

**Contractor**
Any person or body that has undertaken to supply electricity or gas to any purchaser.

**Metering point**
An individual meter found in a multiple customer metering system.

**Multiple customer metering system or device**
Metering system that requires on-site central processing of metrological information for more than one metering point and which meet one of the following criteria:

a) Systems that employ external sensors that are integral to the meter. These systems are generally used in multi-customer applications; however, they can operate as stand-alone, single-point meters.
b) Systems that employ external approved instrument transformers that are not integral to the meter. This includes approved conventional current transformers with up to a 5 amp secondary output, approved current transformers having a secondary output up to 80 mA or 100 mA, and approved voltage transformers. These systems can be used in multi-customer applications; however, they can operate as stand-alone, single-point meters.

## 5.0 Responsibilities

**5.1** The contractor is responsible for providing the original inspection certificates and configuration charts for the system in question, in addition to a wiring chart of the system showing the physical location of all metering components within the complex, when required.

**5.2** The contractor is also responsible for providing a representative with authority to access all metering points.

**5.3** The inspector or accredited organization is responsible for verifying that the contractor has fulfilled all general, administrative and technical requirements of S-E-04.

## 6.0 Guidelines

### 6.1 Preliminary

Prior to conducting any field inspections, the inspection certificates generated from the initial verification of the system and the applicable configuration charts are required. These documents should be supplied by the contractor and will show how the system was configured during the initial verification (in a meter shop), indicating number of metering points per unit, type of metering (1, 2 or 3 elements) association between voltage and current sensors and /or instrument transformers, along with the appropriate connection points for each (where applicable).

### 6.2 Visual examination

**6.2.1** A preliminary visual examination of the components of the system required to be inspected should be conducted to confirm the location of all metering points, terminal interfaces and host meter(s).

**6.2.2** Under ideal circumstances, all metering components (host meter, current sensors, voltage sensors, instrument transformers, main disconnects, etc.) will be located in one central location or electrical room; however, if this is not the case, it is important to establish the number of metering points and their individual locations in relation to the host meter prior to beginning inspections.

**6.2.3** Example worksheets are provided in Appendices A, B and C; they address the general, administrative and technical requirements of S-E-04. Appendix A and portions of Appendix B worksheets should be completed prior to carrying out inspections. The Appendix C worksheet, which relates to technical information, may be completed during on-site inspection work. Record any characteristics which are not in compliance with sections 5.0, 6.0 and 7.0 of S-E-04.

### 6.3 Installation verification

**6.3.1** This section is in reference to section 7.0 of S-E-04 and serves to confirm that the installation of the system is consistent with the system's configuration at the time of its initial verification in the meter shop. This is accomplished by verifying that all voltage and current sensors and/or instrument transformers are properly identified, associated with the correct phase and connected to the correct point on the host meter.

**6.3.2** The system's configuration chart will be required to determine whether the system is properly connected. The most effective and efficient means of conducting this work is by visual inspection, whenever possible.

**6.3.3** If visual inspection is not possible or does not provide conclusive evidence of the correctness of the installation, other options may be used, such as taking voltage readings, de-energizing circuits, using circuit tracers or taking cross phase readings.

### 6.4 Voltage sensors

**6.4.1** Verify that all associated phases and the neutral are connected to the appropriate terminals at the voltage disconnect switch and the appropriate meter connection points according to meter wiring diagrams.

**6.4.2** For example, if voltage connections are colour coded, verify that the red, yellow, blue and white wires are connected to A,B,C and N phase connection points at the meter.

**6.4.3** In systems which utilize external voltage sensors or transducers, the correct connection from the supply source to the primary side of the voltage sensor/transducer and from the secondary side of the voltage sensor/transducer to the voltage connection points on the metering unit must be verified.

**6.4.4** The configuration chart in this case will show the voltage sensor's serial number, which phase it should be associated with and which connection points on the metering unit it should be connected to. If local codes or labelling are used, the metering equipment's manufacturer should be consulted to determine standardized wire coding for both current and voltage sensors.

**6.4.5** For example, in referring to the configuration chart in Appendix E, it shows that voltage sensor number A150 should be associated with A phase and connected to meter connection points 1 and 2. The chart also shows this sensor to be rated for 120 volts.

**6.4.6** If visual inspection is not possible or conclusive, verification may be completed by use of voltage measurements between the initial supply connection point to the meter voltage input connections. A reading of zero volts will confirm that, for example, the A phase meter input is connected to the A phase supply.

### 6.5 Current sensors and terminal interface connections

**6.5.1** If current sensors are directional, they need to be verified for correct polarity. Typically, current sensors have a white dot which indicates the line side.

**6.5.2** Verify that each current sensor is connected to its appropriate connection point on the host meter and that each sensor is connected to the proper phase, according to the configuration chart supplied.

**6.5.3** This verification requires the inspector to verify that each current sensor has appropriate markings and serial numbers, in addition to verifying that each current sensor is associated with the appropriate meter and appropriate phase for that specific meter.

**6.5.4** For example, the configuration chart in Appendix E shows that the current sensor with serial number A9950 is a 100 amp sensor associated with meter number 1 and should be connected to the A-phase on the customer's service. The chart also shows that this sensor is to be connected to points 47 (common) and 48 at the host meter, and that the host meter is programmed to associate meter 1 with the 120 volt power transformer (PT). (Refer to the PT association column.)

**6.5.5** If visual tracing of wiring is not possible or conclusive, the inspection can be completed using a circuit tracer. Typically, a signal will be injected into the current sensor wire at the connection point of the host meter. The configuration chart will identify a specific current sensor being connected to this point, as mentioned above. Using the receiving portion of the circuit tracing unit, identify which current sensor is receiving a signal and then confirm its correctness according to the chart.

**6.5.5.1** Depending on the system being inspected, it may be necessary to isolate the circuit to be checked to prevent the signal from the circuit tracer simultaneously traveling along more than one set of the current transformer's (CT) sensor wires.

### 6.6 Approved instrument transformers

**6.6.1** Systems which utilize separately approved instrument transformers are also required to conform to the applicable Measurement Canada standard drawings. Additional inspection requirements would therefore include the following:

**6.6.1.1** Verifying that all instrument transformers are approved.

**6.6.1.2** Verifying that standardized wire coding is in effect. This could be the use of Measurement Canada's colour code, a local colour code or the use of standardized labelling for wiring. In either case, each transformer's secondary wiring should be identifiable for each phase, supply and return.

**6.6.1.3** Verifying that all secondaries of transformers are tied to a single ground point to ensure the secondary current is not bypassing metering sensors.

**6.6.1.4** Verifying that the polarity of transformers is correct. Typically, a white dot will indicate the line side of the transformer.

**6.6.1.5** Verifying that instrument transformers are appropriately marked as per their respective approval. Ratio checks may be necessary in order to verify that marked ratios are correct.

### 6.7 Phasing

**6.7.1** Verify correct phasing between the meter's voltage connections and the associated current sensors and/or instrument transformers, according to the wiring configuration chart.

**6.7.2** Inspections completed under 6.4, 6.5 and/or 6.6 of this document may have been sufficient to ensure correct phasing between voltage and current connections; however, if this is not the case, it will be necessary to verify that all A , B and C phase current sensors are actually connected to the same phase in which the voltages for A, B and C are connected.

**6.7.3** Typically, this can be accomplished by visual inspection or by taking voltage readings from the voltage connection point at the meter to the phase in which the associated current sensors are connected. A zero volts reading will confirm that these two points are associated with the same phase. This process should be repeated for each phase.

## 7.0 Sealing

Apply installation seals in accordance with section 8.0 of S-E-04.

## 8.0 Inspection certificates

Issue an inspection certificate in accordance with section 21 of the *Electricity and Gas Inspection Regulations*, including a summary of findings. Clearly state on the certificate that the inspection was carried out in accordance with the requirements of S-E-04.

## 9.0 Fees

Charge the hourly rate for inspectors' time and expenses as per Part VI, section 47 of the Regulations.

## 10.0 Written report

Summarize findings in a written report to the contractor describing any action required on the part of the contractor to bring the system into compliance with S-E-04, or any other applicable Measurement Canada requirements. Ensure all potential inequities found during this inspection are properly addressed through appropriate channels.

## 11.0 Revisions

The purpose of this revision is to clarify the definition of the term "multiple customer metering system" in the Definitions section.

## 12.0 Additional information

For additional information, please consult the contact us[link 1] section of the Measurement Canada website or your departmental contact. The copy of this document located on Measurement Canada's website is considered to be the controlled copy.

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[link 1] https://www.ic.gc.ca/eic/site/icgc.nsf/eng/h_07026.html

**Appendices**

The following are worksheets for conducting installation verifications of multiple customer metering systems.

**Appendix A—General**

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| **Date:** | **District:** | **Inspector:** |

**General**

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| **Contractor's legal name:**<br><br>**Mailing address:** |
| **Name of firm or contracting company responsible for installation:** |

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| **Installation address:** | **MCMS manufacturer:** |
| **Date of activation:** | **Model:** |
| **Number of host meters:** | **Number of metering points:** |

**General comments relating to the installation:**

## Appendix B—Administrative requirements

### 5.0 Administrative requirements

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| **5.1.1** Is the contractor registered in accordance with the Act? | Registration number: |
| **5.1.2** Is the device approved for billing processing? | Approval number: |
| **5.1.3** Has the system been initially verified in shop? | Seal year:<br><br>Expiry year: |
| **5.1.4** Have all installations requirements listed in the approval been adhered to?<br>(i.e. service type, voltage ratings, etc.) | |
| **5.1.5** Has auxiliary equipment been installed as per MC guidelines? | |
| **5.2** Has the contractor supplied notification to MC in accordance with requirements? | |
| **5.3** Has the contractor supplied a representative in accordance with requirements?<br><br>**Name of representative:** | |
| **5.4** Has the required documentation been provided by the contractor? | |
| **5.5** Have you been provided appropriate access to all installation components? | |

**Comments:**

## Appendix C—Technical requirements

### 6.0 Technical requirements

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| **6.1** Are all hardware components safely and securely mounted? |
| **6.2** Are there provisions for connecting test equipment to all current sensors? |
| **6.3** Is the voltage being taken from the same source as the currents?<br><br>**6.3.1** Does the voltage differential ensure that the tolerances prescribed by section 31 of the EGIR are met?<br><br>**6.3.2** Are the voltage and current circuits separate and distinct? |
| **6.4** Has the installation been wired to facilitate on-site testing? |
| **6.5** Does the system utilize instrument transformers?<br><br>Is the block or disconnect switch rated between 120 V and 600 V? |
| **6.6** Does the system utilize instrument transformers?<br><br>If so, does the installation have a current test block? |
| **6.7** Is all primary and secondary current and voltage wiring visibly traceable and properly identified? |
| **6.8** Are all sensor serial numbers visible, legible, and permanently affixed? |
| **6.9** Can the phase relationship between the voltage and current circuit for any given meter be verified? |

**Comments:**

## Appendix D—Installation inspection worksheet

### 7.0 Installation inspection

**Note:** This table should be copied for additional meters.

| Host meter | Meter number | Are all voltage sensor/or voltage connections correct (section 7.3.1)? | Are all current sensor and/or transformer connections correct (section 7.3.2)? | Is phasing between voltage and current correct (section 7.3.3)? | Is the correct unit or customer connected (section 7.4.4)? |
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**Note:** Additional inspection requirements for systems utilizing separately approved instrument transformers can be found on following page.

**Appendix D—Installation inspection worksheet (continued)**

### 7.4 Systems utilizing separately approved instrument transformers

| **Standard drawing associated with service type:** |
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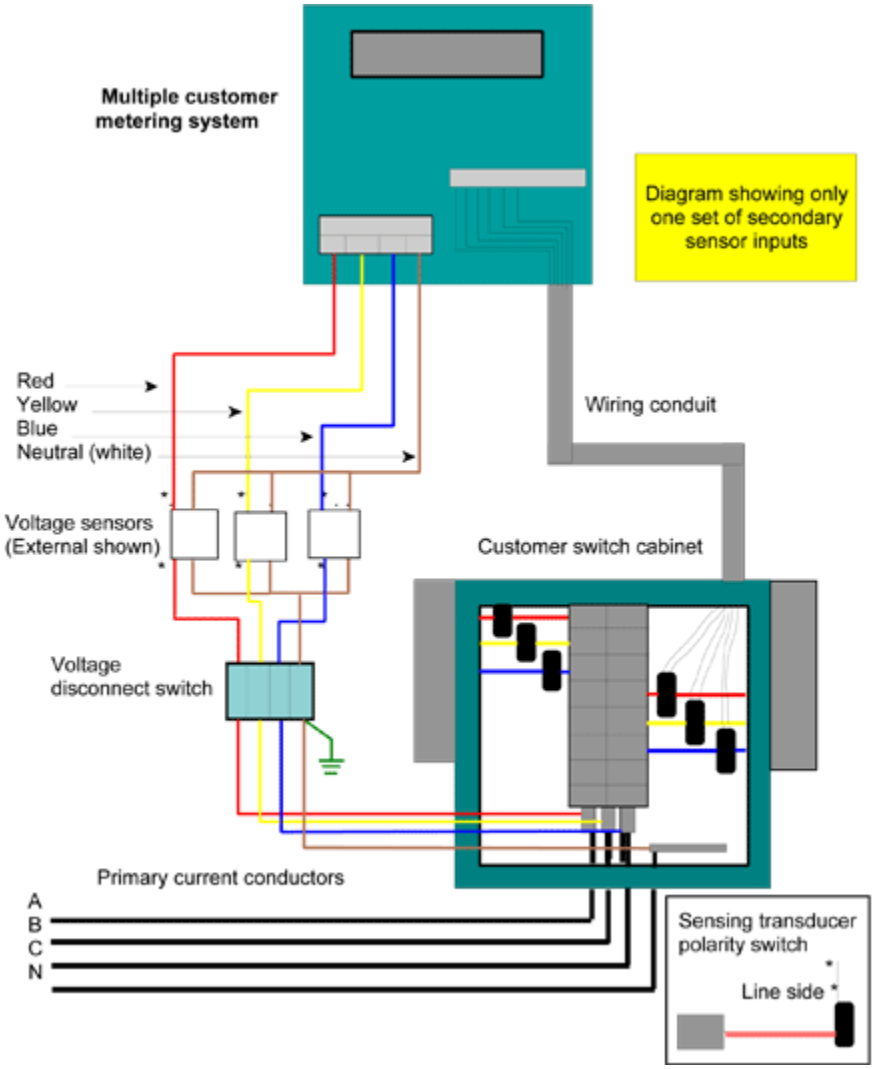
| **7.4.1** Is the system using a standard wire code?<br><br>Identify code use. |
| **7.4.2** Is grounding of secondary wires for instrument transformers correct? |
| **7.4.3** Are the instrument transformers installed according to polarity markings? |
| **7.4.4** Do all instrument transformers have nameplates and appropriate markings?<br><br>What is the type of transformers used?<br><br>What transformer ratio is marked on the nameplate?<br><br>Is the transformer ratio confirmed via dynamic check? |

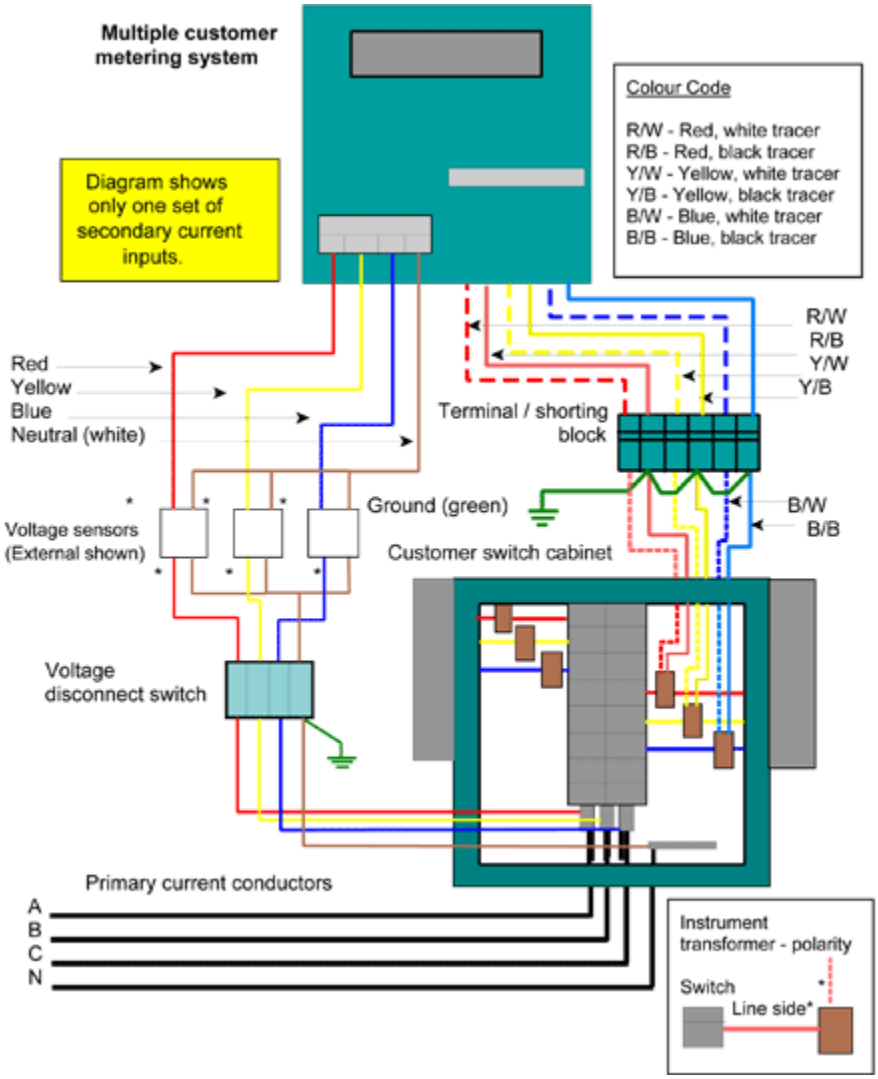
**Comments:**

## Appendix E—Sample configuration chart

| **Meter #** | **Phase** | **CT #** | **CT connection point** | **CT rating** | **PT #** | **PT connection point** | **PT rating** |
|---|---|---|---|---|---|---|---|
| 1 | A/Red | A9950 | 48 and 47 | 100 A | A150 | 2 and 1 | 120 V |
| 1 | B/Yellow | A9951 | 50 and 49 | 100 A | A151 | 4 and 3 | 120 V |
| 1 | C/Blue | A9952 | 52 and 51 | 100 A | A152 | 6 and 5 | 120 V |
| 2 | A/Red | A7770 | 54 and 53 | 200 A | B250 | 8 and 7 | 347 V |
| 2 | B/Yellow | A7771 | 56 and 55 | 200 A | B251 | 10 and 9 | 347 V |
| 2 | C/Blue | A7772 | 58 and 57 | 200 A | B252 | 12 and 11 | 347 V |

## Appendix F—Wiring diagram examples




Multiple customer metering system
Diagram shows only one set of secondary current inputs.
Colour Code
R/W - Red, white tracer
R/B - Red, black tracer
Y/W - Yellow, white tracer
Y/B - Yellow, black tracer
B/W - Blue, white tracer
B/B - Blue, black tracer
R/W
R/B
Y/W
Y/B
Red
Yellow
Blue
Neutral (white)
Terminal / shorting block
Ground (green)
B/W
B/B
Voltage sensors (External shown)
Customer switch cabinet
Voltage disconnect switch
Primary current conductors
A
B
C
N
Instrument transformer - polarity
Switch
Line side*