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Polyphase Electronic Meters: Installation and Use

March 2013



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1 INTRODUCTION

This document introduces a standard arrangement for the installation and use of the Landis & Gyr **EM5100** and the Secure **Sprint** polyphase electronic meters across Essential Energy.

This document covers the various program options available for the EM5100 & Sprint meters when used to register energy consumptions at installations where there are multiple phases, and load currents which are less than 100 amps per phase. The EM5100 & Sprint meters may be used for principal tariff, controlled load and both gross and net grid interactive applications which involve either multiple inverters or multi-phase inverters.

2 WHY THESE INSTRUCTIONS ARE IMPORTANT

This Code of Practice forms an integral part of Essential Energy's standard metering arrangements and will ensure a consistent approach to the programming and commissioning of electronic meters.

3 CHALLENGES

Meters fitted to customers' installations must adhere to Essential Energy metering Codes of Practice. Incorrect selection/fitting of metering devices will lead to billing problems and must to be replaced with the correct device.

4 THE PROCEDURES

4.1 Common features of the 3 phase electronic meters:

- 100 Amperes per phase maximum current rating – direct connect
NOTE: higher current installations require current transformer (CT) metering
- Bottom connected
- 3 phase, 4 wire configuration
- Class 1 accuracy
- Programmable. (Delivered pre-configured)

The dimensions of the meters are:

EM5100: 173(W) x 237(H) x 78(D) (mm)

Sprint: 175(W) x 250(H) x 67(D)(mm)

The EM5100 & Sprint meters mounting configuration is within a few mm of poly-phase meters traditionally used within Essential Energy footprint. In most instances it shouldn't be necessary to modify the meter panel when replacing an existing poly-phase meter.

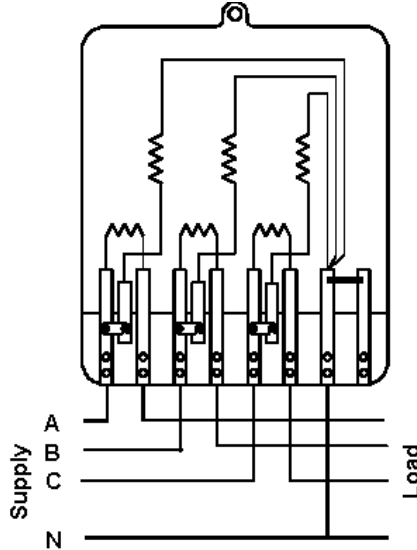
The EM5100 & Sprint meters may also be used to meter 2 phase applications. In these instances a bridging wire must be placed between one of the incoming active wires and the unused phase input (i.e. to ensure all potential indicators are lit).

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4.2 Meter Connections

4.2.1 Meter Terminals

The meter connections are shown below (front view).



4.2.2 Pulse Outputs

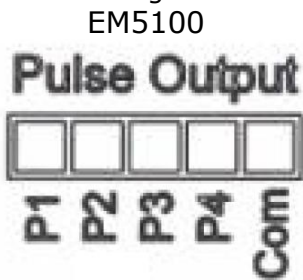
Both meters are capable of providing output pulses proportional to imported energy and exported energy. The EM5100 also provides an "End of Interval" pulse output.

EM5100

Outputs pulse at the rate of 1 Wh/pulse and are in the form of solid state relays (SSRs) with maximum ratings of 250 volts AC/DC and 100 milliamps; see connection diagram below.

Sprint

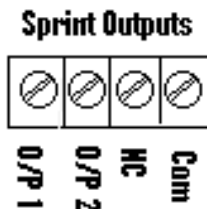
Outputs pulse at the rate of 100 Wh/pulse and are in the form of solid state relays (SSRs) with maximum ratings of 240 volt, 100 milliamp AC or 40 Volt, 5 milliamp DC. See connection diagram below.



Pulsed Outputs and Input Assignments

Terminal No. (as viewed from the bottom of meter left to right)	Assignment
P1	Wh Imported
P2	Wh Exported
P3	End of Interval
P4	NA
Com	Common 1 to 4

Sprint



Pulsed Outputs and Input Assignments

Terminal No. (as viewed from the bottom of meter left to right)	Assignment
OP1	Wh Imported
OP2	Wh Exported
NC	NA
Com	Common

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4.3 Configuration

All EM5100 & Sprint meters supplied by Essential Energy shall be pre-configured. The default program for standard principal tariff meters sourced from Essential Energy warehouses supports a three rate profile which can be used for time-of-use (TOU) tariffs. Billing registers in this program are 001, 002, 003 for EM5100 meters & 01, 02, 03 for Sprint meters. Other options are available via request please see table below.

The presence of a TOU program is identified by a white label endorsed with the letters TOU and mounted externally on the meter face. Other configurations, their availability, and description are shown in the following table.

EM5100

Application	Availability to EE staff	Meter label	Availability to Level 2 service providers	Billing Registers
Three phase principal tariff	Via a meter requisition form to warehouse.	TOU Code 3J	Via a meter requisition form to warehouse.	001, 002, 003
Three Phase controlled Loads.	Via a meter requisition form to warehouse.	Controlled Load Please read Register 90 Code 3J	Via a meter requisition form to warehouse.	090
Master/Subtraction meters	Via an email to Meter Orders	Master Meter Please read Register 10 Code 3J	Not Available.	010
Grid Interactive Gross Metering	Via a meter requisition form to warehouse.	Use for Gross Export Code 3S	Via a meter requisition form to warehouse.	001, 002, 003, 070
Grid Interactive Net Metering	Via a meter requisition form to warehouse.	Use for Net Export Code 3N	Via a meter requisition form to warehouse.	001, 002, 003, 110.

Table 1

Sprint

Application	Availability to EE staff	Meter label	Availability to Level 2 service providers	Billing Registers
Three phase principal tariff	Via a meter requisition form to warehouse.	TOU Code Z3	Via a meter requisition form to warehouse.	01, 02, 03
Three Phase controlled Loads.	Via a meter requisition form to warehouse.	Controlled Load Please read Register 90 Code Z3	Via a meter requisition form to warehouse.	90
Master/Subtraction meters	Via an email to Meter Orders	Master Meter Please read Register 10 Code Z3	Not Available.	10
Grid Interactive Gross Metering	Via a meter requisition form to warehouse.	Use for Gross Export Code ZG	Via a meter requisition form to warehouse.	01, 02, 03, 70
Grid Interactive Net Metering	Via a meter requisition form to warehouse.	Use for Net Export Code ZN	Via a meter requisition form to warehouse.	01, 02, 03, 15.

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Table 2

4.4 Meter Display

The meter display will continually scroll between 7 or 8 registers at six second intervals. The meters also provide a manual scroll buttons to enable quick advancement through the display registers. For further detail regarding these registers, (refer clause 5.0.). Energy units will be displayed in whole Kwh only, with the EM5100 using 6 digits and the Sprint, 7 digits for their consumption displays.

4.5 Documentation

Each separate metering rate is identified by a display code. Energy recorded during each TOU period will be shown on the scrolling display along with the register code; these register IDs and where appropriate, the associated energy readings; shall be recorded on any associated paperwork.

i.e.: Display code

- 001 or 01 for rate "A" and indicates registration during Peak periods
- 002 or 02 for rate "B" and indicates registration during Shoulder periods
- 003 or 03 for rate "C" and indicates registration during Off-Peak periods



E.g.: The displays indicating 2841 units on Rate "A".

Accumulation registers (non TOU) also have display codes:

- 010 or 10 for total consumption for subtraction applications
- 090 or 90 for total consumption for controlled load applications.
- 070 or 70 for the total energy exported to the network when configured for Gross feed-in-tariff (FIT)

For total energy exported to the network in a Net FIT configuration the registers differ between the two meters:

- 110 for EM5100
- 15 for Sprint.

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4.5.1 Level 2 Authorised Service Providers

All service work activities require a Notification of Service Work (NOSW).

Guide

Meter No	No of Dials	Register No.	Reading	Tariff
The eight digit number displayed on the face of the meter	The EM5100 will display 6 dials & the Sprint 7.	EM5100 register ID that precedes the reading. Eg 001, 002 003, 010, 070, 090, or 110. Sprint register ID that precedes the reading. e.g. 01, 02, 03, 10, 90, 70, & 15	This is the energy consumption in units and must be recorded for all energy registers.	The following Descriptions are to apply. D – Domestic Installation C – Commercial installation R – Rural installation 1 – Off peak 1 2 – Off peak 2 70 - Gross FITEM5100 & Sprint. 110 - Net FIT EM5100 15 – Net FIT Sprint

4.5.2 Essential Energy Staff

Depending on the nature of the metering activity, a NOSW or Metering/FI Relay Change Notice, is to be completed.

Guide

Meter No	Dials	Register ID	Code	Tariff
The eight digit number displayed on the face of the meter	The EM5100 & Sprint will always have 7 Dials	The Billing registers only - dependent upon the program installed (4.3)	The EM5100 has a Code 3J which is displayed on the face of the meter. A replacement code of either 3N or 3S will be displayed on the program Label for meters configured to support either a Net or gross feed in tariff. The Sprint has a code Z3 which is displayed on the face of the meter. A replacement code of either ZN or ZG will be displayed on the program Label for meters configured to support either a Net or Gross feed in tariff respectively.	If the tariff codes are unknown, then refer to 4.6.1 for basic definitions.

4.6 Installation

The EM5100 & Sprint meters shall be used to register multi phase principal tariffs, typically light and power, multiphase controlled load and both Gross and Net FIT.

Where single phase controlled load forms part of a multiphase installation, a single phase accumulation meter is to be used in conjunction with the EM5100 or Sprint meter. This accumulation meter will monitor the controlled load component.

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Alternatively, where the controlled load component requires multiple phases in conjunction with the principal tariff, an additional three phase meter, purposely programmed to display register 90 will also need to be installed (refer to tables 1 or 2).

For multiphase principal tariff where there is subtractive metering associated with the principal tariff meter, Essential Energy will fit a register 10 meter at the master meter location (refer to tables 1 or 2).

4.6.1 Sealing

The terminal cover has two sealing facilities, both of which must be utilised on every occasion. The main cover will be sealed by the manufacturer.

4.6.2 Consumption Indicator

The EM5100 & Sprint meters have a pulsing LED to indicate consumption. This LED will flash at a rate of one pulse per watt-hour for the EM5100 & 800 pulses per kilowatt-hour for the Sprint meter.



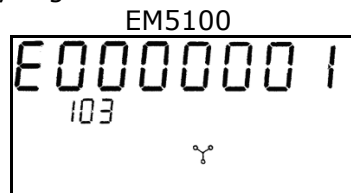
4.7 Errors and warnings

4.7.1 Error Monitoring

The EM5100 & Sprint meters are continually performing checks of their internal operations. Should an error be detected, then the meter stops scrolling and displays an error message. If an error is displayed, it must be reported to Essential Energy. A replacement unit will be fitted by Essential Energy staff as part of the maintenance program.

4.7.2 Error codes for EM5100

These codes are identified by register indication E.



eg The display indicating error 000001

Codes are as follows:

E 0000001	Real Time Clock
E 0000010	Programming Error
E 0000100	Class checksum error

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E 0001000 Internal communications failure

4.7.3 Error display for Sprint

If the Sprint meter has been configured to display operational status, it will report "status OK" for correct operation, or "status plus" an **error code** if any errors have been detected.

Any sprint meter detected displaying an error code is to be replaced and returned for repair.



eg The "Status OK" display



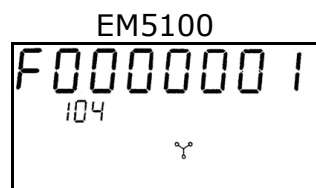
eg Error code 1

4.7.4 Warning Displays for EM5100

This display indicates that the meter detected an event which requires a review. In most cases these events will have not directly impacted upon readings within the meter.

For example the meter contains an internal battery used to maintain time and calendar functions during outages. Should the battery voltage fall below acceptable limits, a warning code will be displayed.

At present Essential Energy doesn't service these electronic meters in the field, therefore any meter flagging a warning which cannot be corrected by the installing technician on site, must be replaced.



eg The display indicating a low battery warning

Codes are as follows:

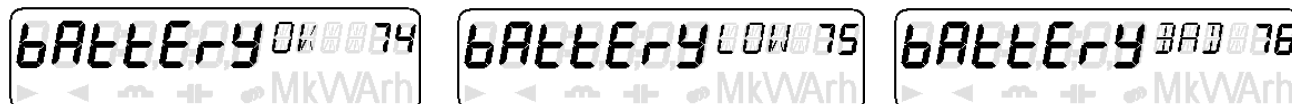
F 0000001	Low battery voltage
F 0000010	Demand overload
F 000100	Reverse energy detected
F 001000	Loss of phase or phase sequence
F 010000	Load profile error
F 1000000	TOU error
F 20000001	Power Fail Warning
F 20000002	External Module (Pulsed Input) low battery voltage
F2 0000003	Power Fail Warning & External Module low battery voltage.

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4.7.5 Warning Displays for Sprint

The only warning which will be displayed by the Sprint is associated with monitoring of the internal battery, if the meter is configured with this option



If a message other than Battery OK is detected then the meter is to be returned for repair.

4.8 Commissioning Checks

EM5100

- a Ensure there are no loose connections and wiring is arranged as per diagrams supplied
 - b Apply voltages to the meter and check for correct phase sequence (three phase installations)
 - c Check that all three LEDs (top centre of the meter) are illuminated.
 - d Check the meter display and ensure it is scrolling and no errors are displayed
 - e Ensure the date and time, are correct (Eastern Standard Time)
 - f Select Alt 2 Display by pressing the Alt Display Button twice.
 - g Attach a suitable load to the meter (eg Household load or a 100W lamp)
- *Note:** It is preferable to have load applied to one phase at a time, for these checks.
- h Now view scrolling displays and confirm the voltage, current and Power factor, indicators are correct for the relevant phases.
 - i Check for "Correct Energy flow" by confirming that only, quadrant 1 or 4 indicators are displayed when the amps reading is being displayed (for each relevant phase).
 - j Return the meter to Standard Display by pressing the Alt Display Button once more.
 - k Seal the meter terminal cover as per established guidelines
 - l Complete and lodge paperwork as appropriate.

SPRINT

- a Ensure there are no loose connections and wiring is arranged as per diagrams supplied
 - b Apply voltages to the meter and check for correct phase sequence (three phase installations)
 - c Check the meter display and ensure it is scrolling and no errors are displayed
 - d Ensure the date and time, are correct (Eastern Standard Time).
 - e Attach a suitable load to the meter (eg Household load or a 100W lamp)
- *Note:** It is preferable to have load applied to one phase at a time for these checks.
- f Now view and confirm the LED is pulsing at a rate proportional to the applied load. (ie Approximately 13 pulses per minute for every 100w applied).
 - g Check for "Correct Energy flow" by reference the consumption indicators at the bottom left of the display and confirming it is pointing to the right.

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- h Seal the meter terminal cover as per established guidelines
- i Complete and lodge paperwork as appropriate.

4.9 End of Useful Life

4.9.1 Removal

It is not possible to retrieve data while the meter is de-energised. The technician removing the meter must document the readings from each register prior to disconnection. For EM5100, this will necessitate three separate readings to be taken, namely registers 001, 002 and 003 for the standard TOU meter. For Sprint, this will necessitate three separate readings to be taken, namely: registers 01, 02 and 03 for the standard TOU meter.

Where insufficient space is offered on the NOSW or internal meter change sheet, a second or third form is to be submitted and endorsed accordingly.

Where an EM5100 or Sprint meter cannot be read due to meter errors or defective display, a notation stating “unable to read” is to be made on the NOSW or Meter Change Notice.

4.9.2 Return

Methods of return are not within the scope of this document.

Therefore, until further notice, existing policies regarding returns will remain in place.

However please be aware that these meters contain batteries which begin to discharge when disconnected, so their prompt return is desirable.

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5 READING THE EM5100 & SPRINT METERS

EM5100



Sprint

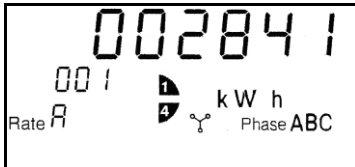


Register Identifier: The meter will scroll at rates of 5-7 seconds for each display. There is a manual scroll button which overrides of these standard display times. These displays are as follows and are shown in the sequence in which they will be displayed on the meter.

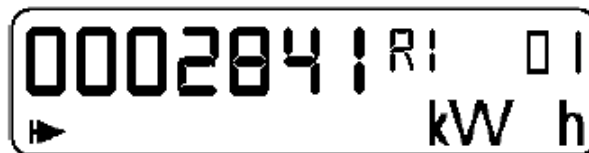
5.1 kWh – Peak (rate A for EM5100 / rate 1 for Sprint)

This display is identified by register number 001 or 01 respectively. The display indicates the KWH registration for the principal tariff (eg Domestic or Non Urban) between the times of 07:00 – 09:00 plus 17:00 – 20:00 weekdays. Registration is displayed in whole kWh.

EM5100



Sprint

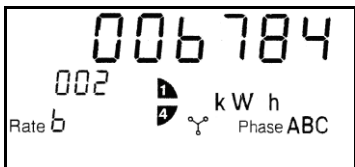


E.g. The display indicating 2841 kWh on Rate A or Rate 1 respectively – Principal Tariff

5.2 kWh – Shoulder (rate B for EM5100 / rate 2 for Sprint)

This display is identified by register number 002 or 02 respectively. The display indicates the kWh registration for the principal tariff (eg Domestic or Non Urban) between the times of 09:00-17:00 plus 20:00- 22:00 weekdays. Registration will be displayed in whole kWh.

EM5100



Sprint

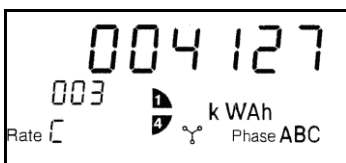


eg The display indicating 6784 KWHs on Rate B or Rate 2 respectively– Principal Tariff

5.3 kWh – Off peak (rate B for EM5100 / rate 2 for Sprint)

This display is identified by register number 003 or 03 respectively. The display indicates the KWH registration for the principal tariff (eg Domestic or Non Urban) between the Times of 22:00 – 07:00 weekdays and all weekends. Registration will be displayed in whole kWh.

EM5100



Sprint



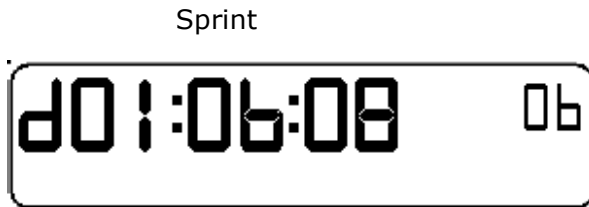
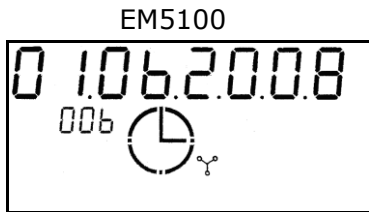
eg The display indicating 4127KWHs on Rate C or Rate 3 respectively– Principal Tariff

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5.4 Date

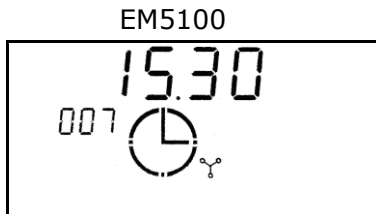
This display is identified by register number 006 or 06 respectively and will be displayed in the format DD.MM.YYYY or DD.MM.YY respectively.



eg The display indicating the 1st of June 2008

5.5 Time

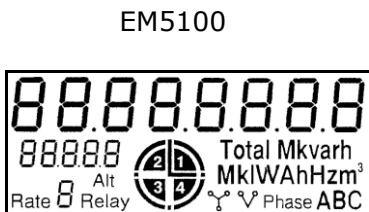
This display is identified by register number 007 or 07. Time will be displayed in 24 hour format and will always be set to Eastern Standard Time.



eg The display indicating 15:30

5.6 Display Segment Test

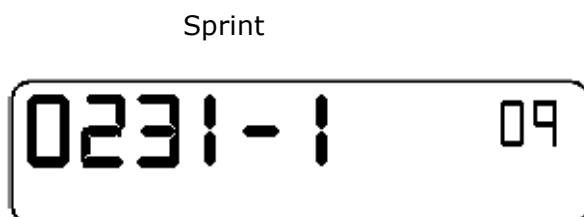
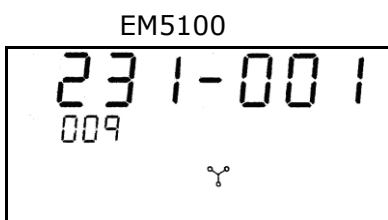
This display enables the user to confirm that all parts of the display are operational. It is essential to confirm the display to validate any readings taken.



Display Segment Test

5.7 Program ID

This display is identified by register number 009 or 09 respectively and will be displayed in the format.



eg The display indicating program 231-01

5.8 Active TOU Rate

This display indicates the active TOU tariff, and is identified by register number 005 or 05 which will be displayed in the format.



eg The display indicating current TOU being rate B / 2 respectively

5.9 kWh Gross Export

When a meter has been programmed to support Gross feed in tariff applications, register number 070 will be displayed showing the total kWh exported.



eg The display indicating 28907 kWh - Export (Gross FIT)

5.10 kWh Net Export

When a meter has been programmed to support Net feed in tariff applications, register number 110 (EM5100) or 15 (Sprint) will be displayed showing the total kWh exported.



eg The display indicating 8279 kWh – Export (Net FIT)

5.11 kWh Master/Sub Applications

When a meter has been programmed to support Master Sub applications, register number 010 will be displayed showing the total kWh consumed. This will be the only active billing register in meters configured for this application.



eg The display indicating 42801 kWh – Master

5.12 kWh Controlled Load Applications

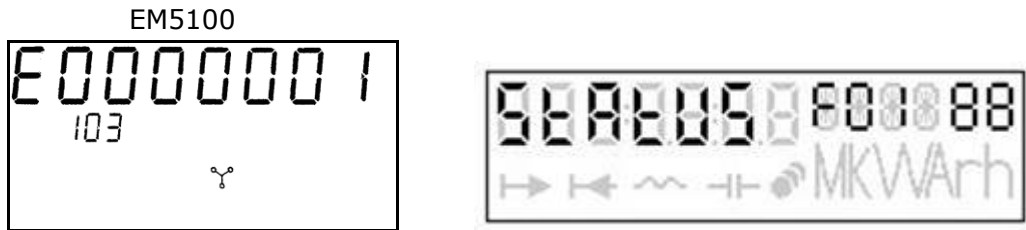
When a meter has been programmed to support controlled load applications, register number 090 will be displayed showing the total Kwh consumed. This will be the only active billing register in meters configured for this application.



eg The display indicating 18402 kWh – controlled load

5.13 Error Indicator (when displayed)

This display is identified by register indication E. This display reports internal errors associated with the meter. If no errors are to be reported then the display will not be displayed. Should an internal error occur the meter will cease scrolling and report an error code. A service call is required to clear this error.



eg The display indicating error code 1 (No scrolling with EM5100)

5.14 Battery Warning Display – EM5100 only

This display is only visible when reporting battery faults and is identified by register indication F. The meter contains an internal battery which is used to maintain time and calendar functions during outage times. At midnight the meter performs a test of this reserve battery. Should the battery voltage fall below acceptable limits an error is displayed. A service call is required to clear this error.



eg The display indicating a low battery warning

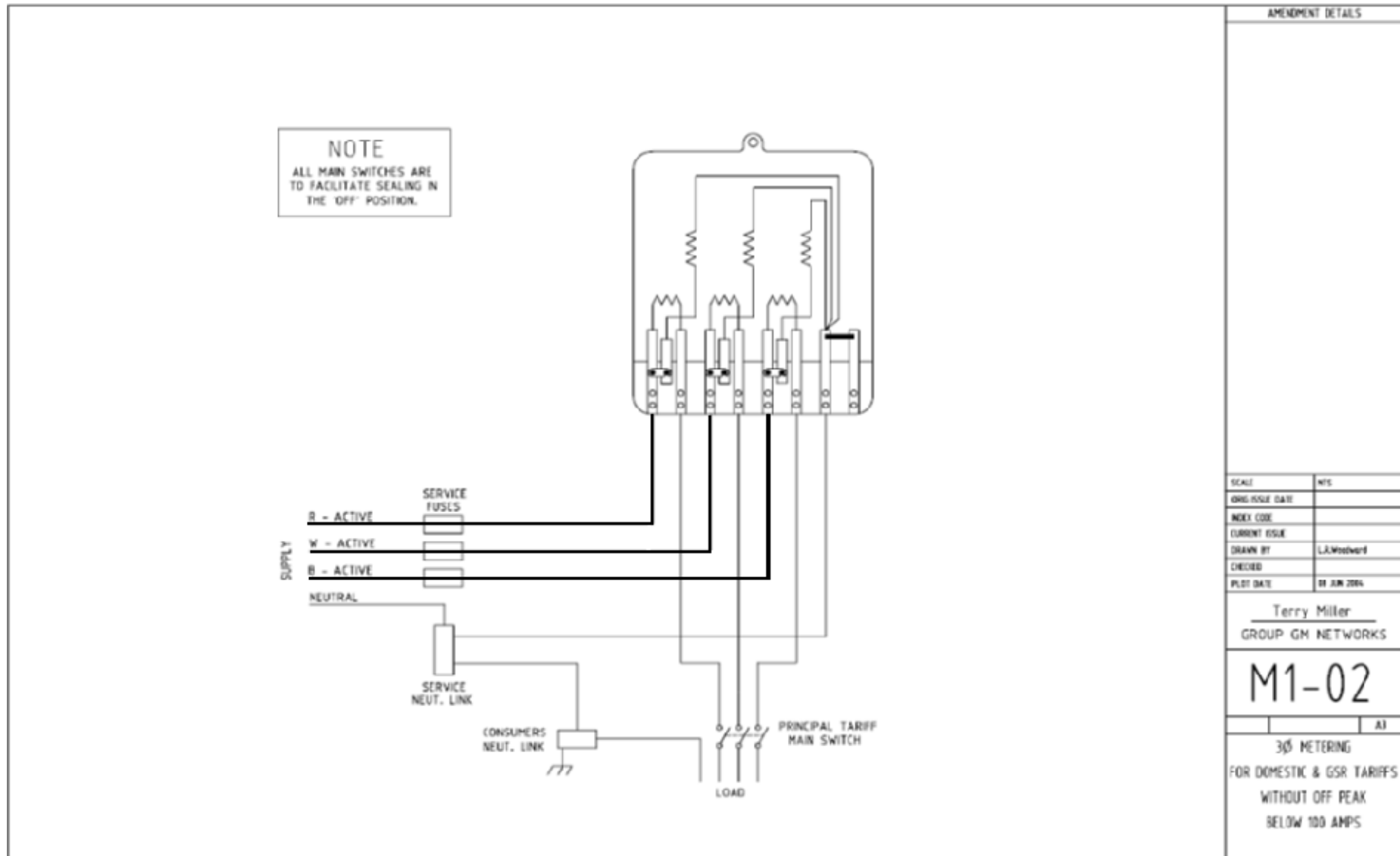
6 WIRING DIAGRAMS

When wiring for NET FIT use either wiring diagram M1-02, M1-05, M1-11, M1-12 (as appropriate) and exchange the "Principal Tariff meter" with "Net Configured meter".

For Gross arrangements please refer to CEM8014.68 and CEM8014.69, available from the Policy Library or the Essential Energy website.

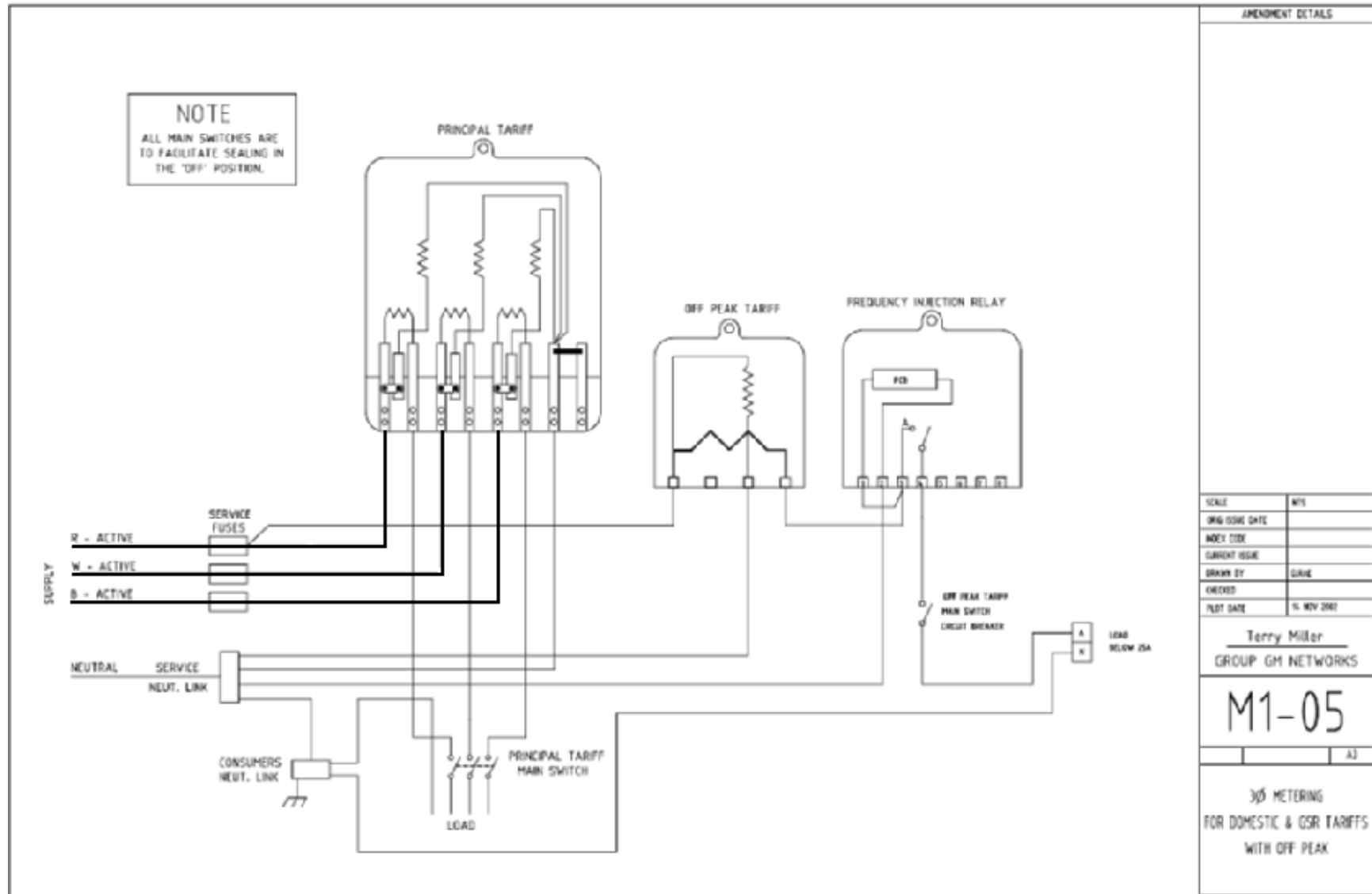
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6.1 M1-02 Three phase metering for domestic & GSR tariffs without Off Peak



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6.2 M1-05 Three phase metering for domestic & GSR tariffs with Off Peak

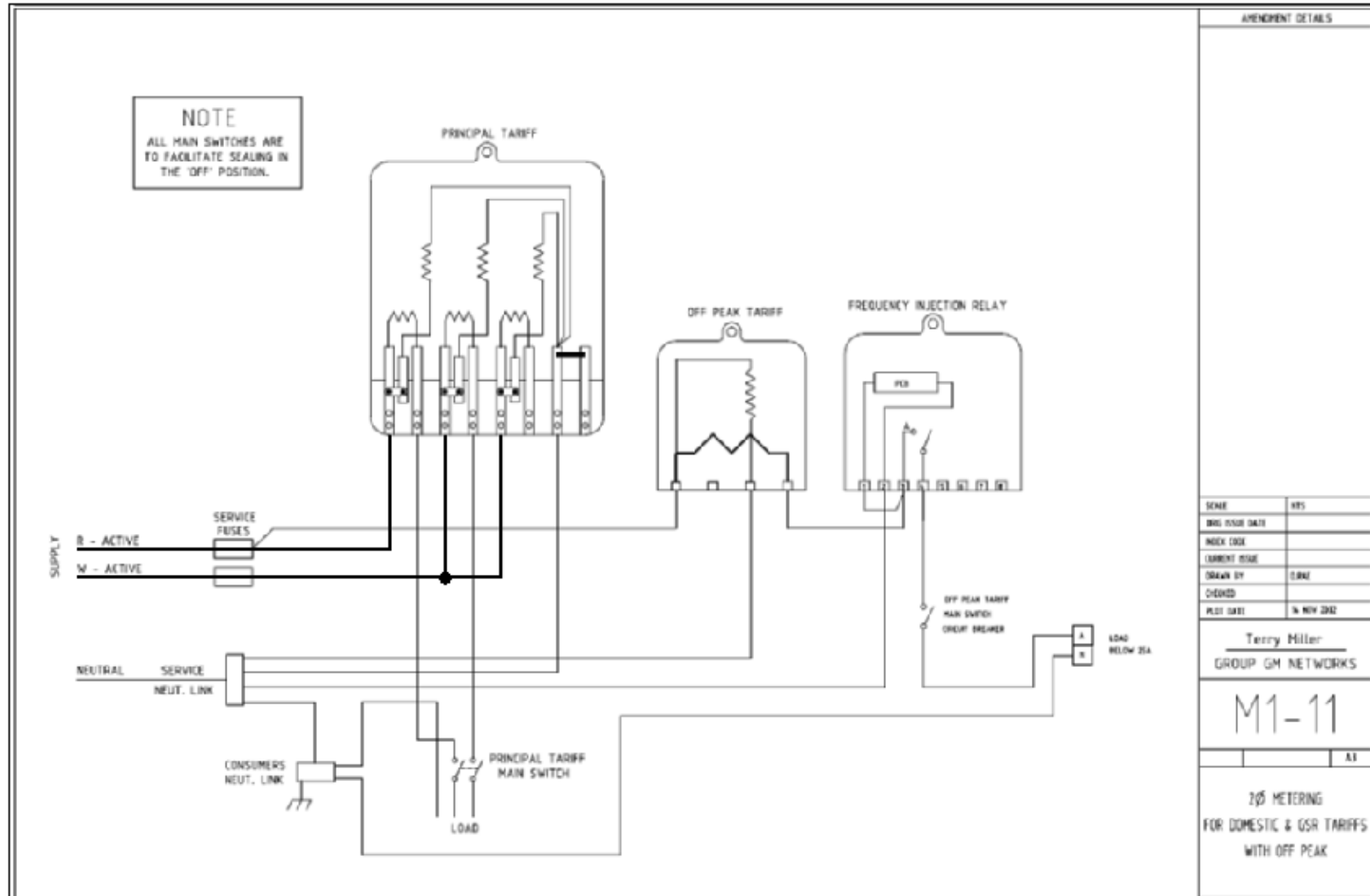


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6.3 M1-11 Two phase metering for domestic & GSR tariffs with Off Peak

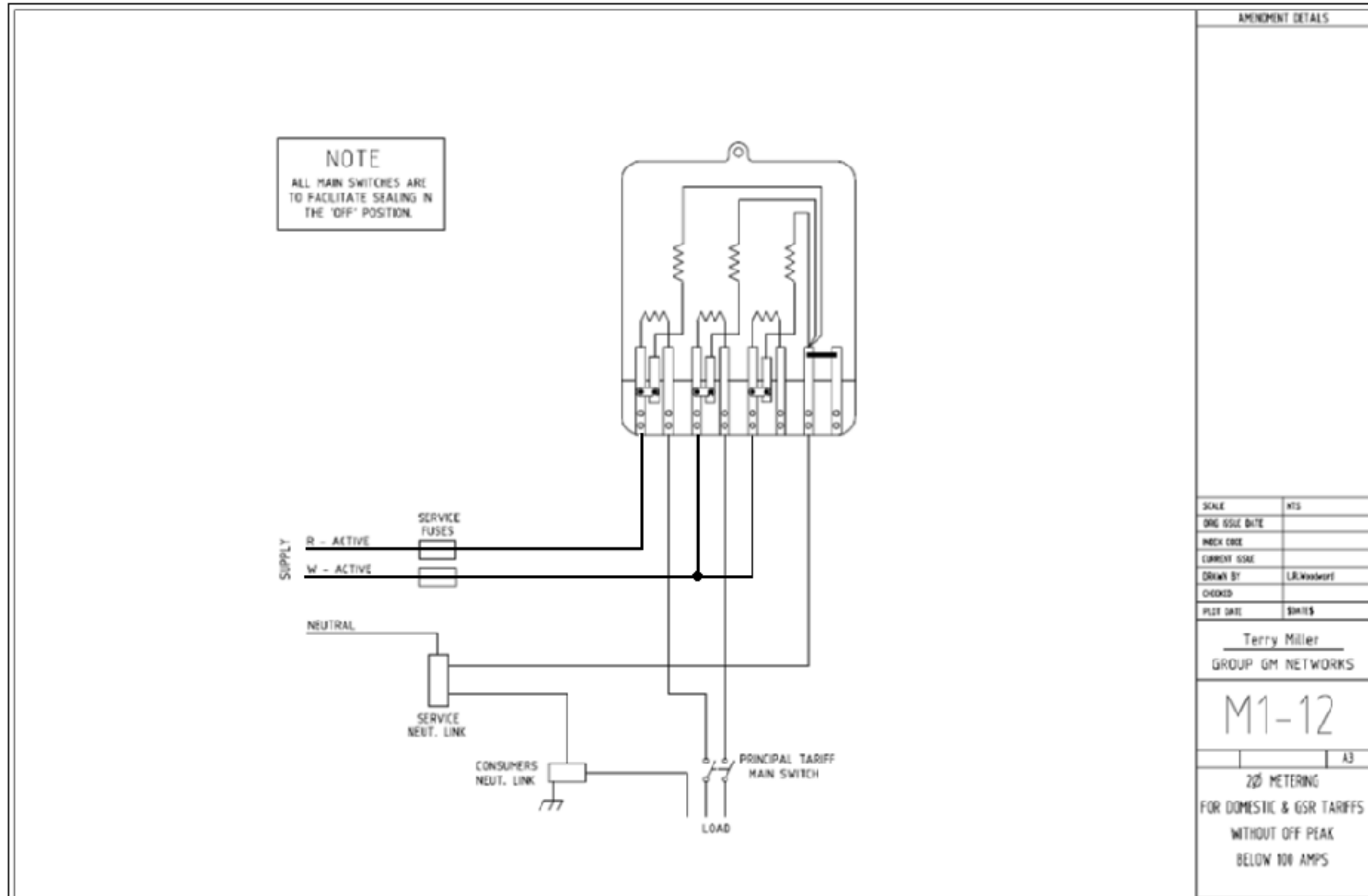


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6.4 M1-12 Two phase metering for domestic & GSR tariffs without Off Peak



AMENDMENT DETAILS	
SCALE	NTS
ORG ISSUE DATE	
INEX CODE	
CURRENT ISSUE	
DRAWN BY	LR Woodford
CHECKED	
PLOT DATE	09/05/08
Terry Miller GROUP GM NETWORKS	
M1-12	
A3	
2Ø METERING FOR DOMESTIC & GSR TARIFFS WITHOUT OFF PEAK BELOW 100 AMPS	

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CEOM8014.50

7 DRILLING TEMPLATE

The Drilling Template is not included in this document, to prevent inaccurate sizing. The EM5100 Drilling Template can be sourced via the Essential Energy website.

8 REFERENCES

CEM8014.68 - Gross Metering arrangement Three Phase installations (Single Phase Grid Connector Inverter)

CEM8014.69 - Gross Metering arrangement Three Phase installations (Multi Phase Grid Connect Inverter)

CEOF6029 Meter change notice.

CEOP8038 Notification of Service Work (NOSW)

9 REVISIONS

Revision Number	Section	Details of Changes in this Revision
2	All	Previously numbered CEPG9048
		Add details for both Net & Gross FIT applications.
3		
4	All	Add references to Secure meter & minor editorial changes