

TEST REPORT
Engineering Recommendation EREC G100 version 2
Technical Requirements for Customers' Export and Import Limitation Schemes

Testing Laboratory : Shenzhen Growatt New Energy Co., Ltd

Address : 4-13th Floor, Building A, Sino-German Europe Industrial Demonstration Park, No. 1, Hangcheng Avenue, Bao'an District, Shenzhen, Guangdong, China.

Tel : +86 755 2951 5888

Web site : www.growatt.com

Test specification:

Standard : EREC G100 version 2

Test procedure : Type approval

Non-standard test method : N/A

Test item description : Hybrid inverter

Trade Mark : GROWATT

Manufacturer : Shenzhen Growatt New Energy Co., Ltd

Model/Type reference : SPA 4000TL3 BH-UP, SPA 5000TL3 BH-UP, SPA 6000TL3 BH-UP, SPA 7000TL3 BH-UP, SPA 8000TL3 BH-UP, SPA 10000TL3 BH-UP.

List of installation components (CLS):

Type of appliance/ Installation : three-phase Energy meter

Manufacturer / Distributor / Installer : Zhejiang Eastron Electronic Co., Ltd

Brand.....: EASTRON

Model/Type.....: SDM230-Modbus

Rating.....: 230Vac, 0.5~10(100) A
50/60Hz, 1000imp/KWh, CAT III

Power accuracy:1%

Firmware Version: V1.2

Test item particulars :

Temperature range : -25°C ~60°C

IP protection class : IP 65

Possible test case verdicts:

- test case does not apply to the test object : N/A
- test object does meet the requirement : P(Pass)
- test object does not meet the requirement : F(Fail)

The power of the test model : SPA 5000TL3 BH-UP

Testing time :

Date (s) of performance of tests : 31 Jul 2023 – 2 Aug 2023

Signed :



General remarks:

The test results presented in this report relate only to the object (single inverter unit) tested and base on Low Voltage connected on small power station. The information about Generating Plant is not consider and tesing.

Installer and relevant persons shall comply with G100 and relevant standard and Grid Code in G100

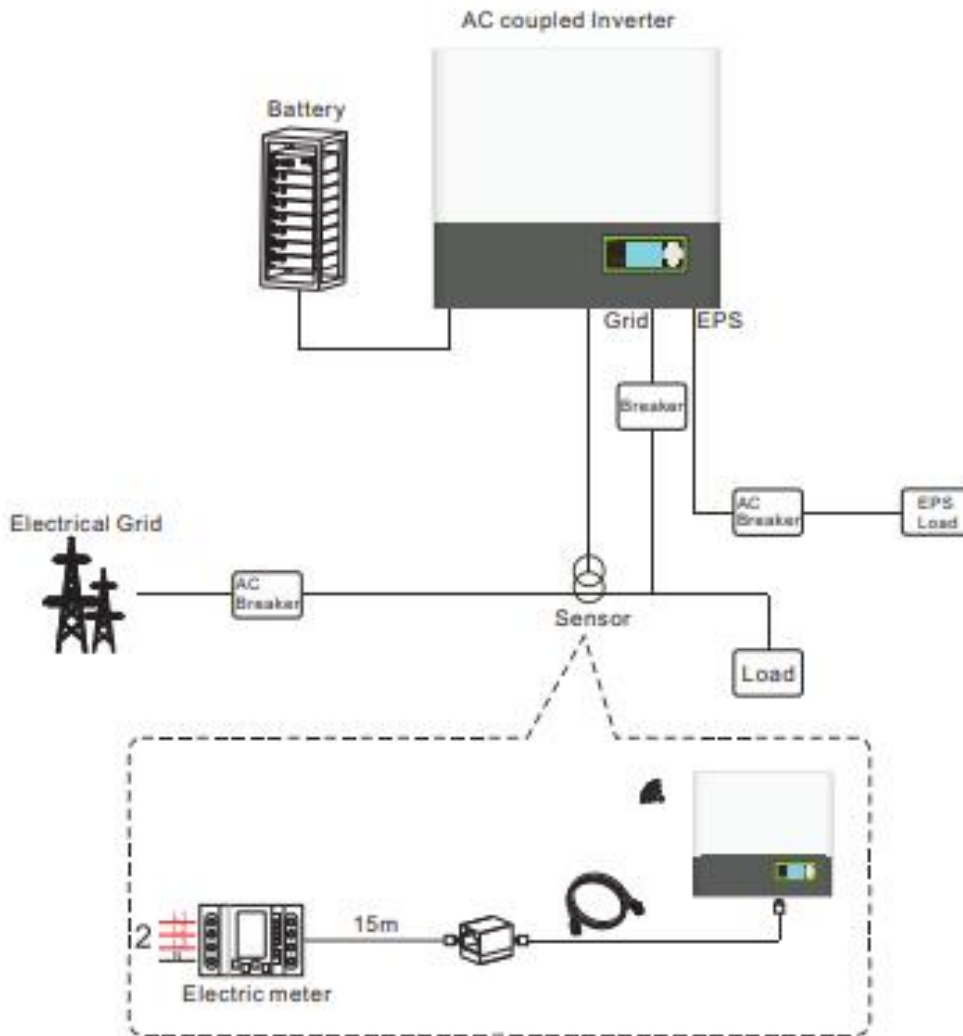
Determination of the test result includes consideration of measurement uncertainty from the test equipment and methods.

The test results presented in this report relate only to the item tested. The results indicate that the specimen partially complies with standard" EREC G100 version 2". See general product information next for details information.

General product information:

The System comprising of smart meter providing control signals that communication with the Hybrid inveter the RS485 interface in real time, the smart meter will install at the Connection Point and sense the power (measures the current and voltage) send to inverter, so that can control the net flow of electricity into the Distribution Network at the connection Point so as not to exceed the MEL.

Basic outline of the system as following:

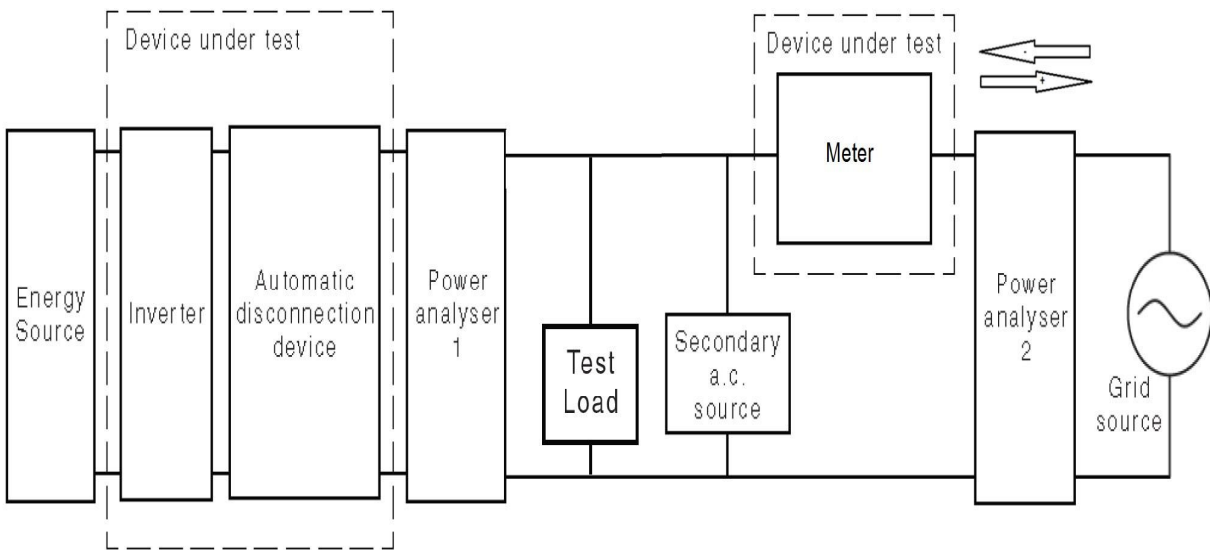


Factory information:

Factory and address: Guangdong Growatt New Energy Co., Ltd.

Growatt Industrial Park, No.17 Pingheng Road Pingtan Town,Huiyang District,Hui zhou,Guangdong, China

Test of setup-Injection testing:



Export/Import capabilities

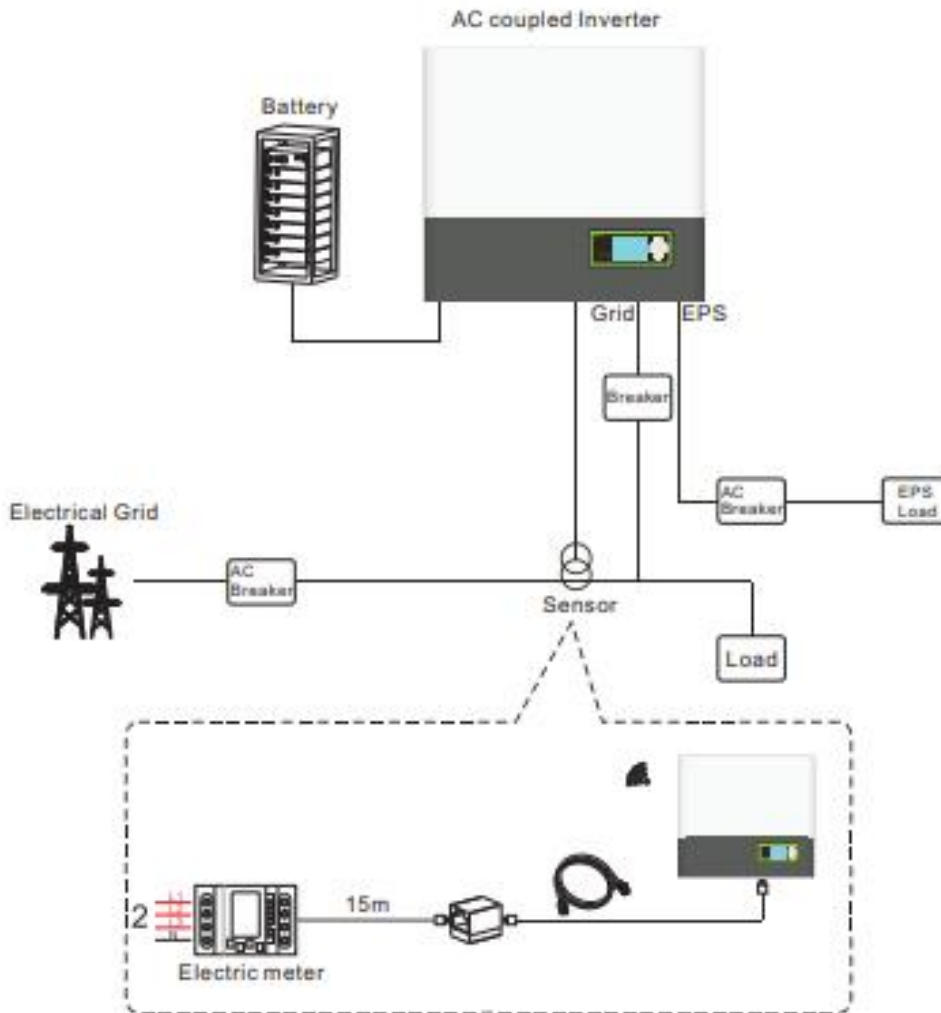
Export	Y	Import	N
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Description of Operation

EREC G100 section 4.2, requires a description of the **CLS**, and schematic diagram, to be provided to the **Customer**. Please provide that description and the diagram here.

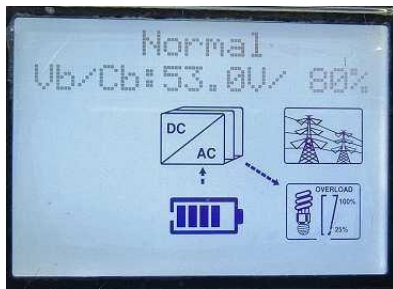
The System comprising of smart meter providing control signals that communication with the Hybrid inverter the RS485 interface in real time, the smart meter will install at the Connection Point and sense the power (measures the current and voltage) send to inverter, so that can control the net flow of electricity into the Distribution Network at the connection Point so as not to exceed the MEL.

Basic outline of the system as following:

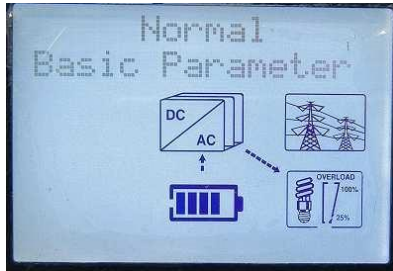


How to set and control:

LCD display panel of Hybrid inverter can be set to CLS enable and disable, or set percent of MEL 1, Power on

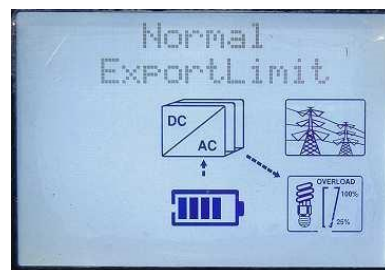
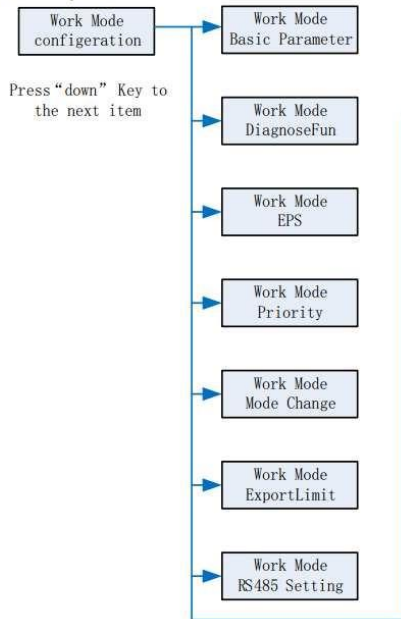


2, Press "OK" key for longer 3 sec, and enter into the setting menu

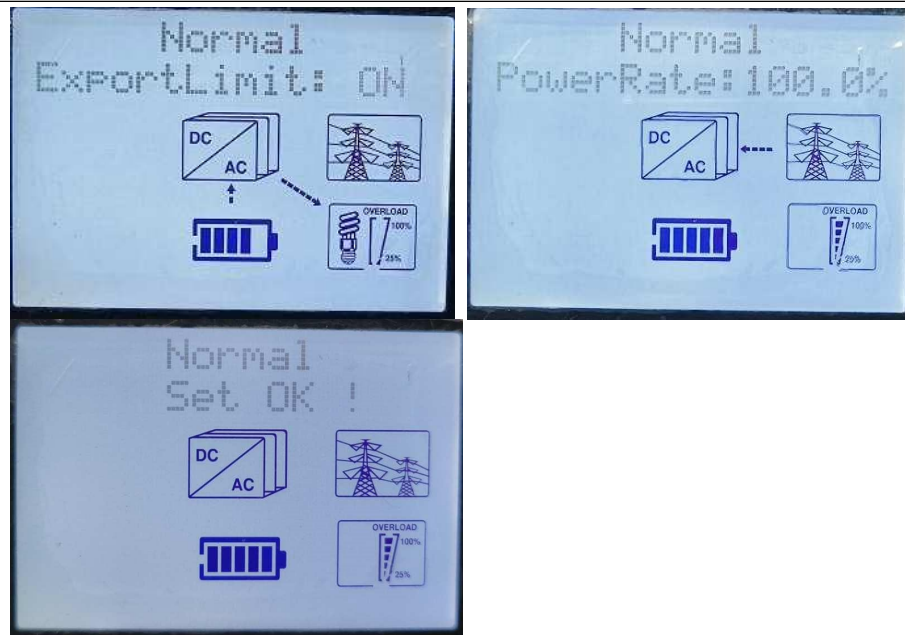


3, Press "▲" or "▼" key to find "Exprotlimit" selection

Press "OK" Key more than 3 second Into setup Mode



4, Press key "OK" or "▲" to enable the export limit function and set MEL



Note:

- 1, Once the export limit function is set OK, inverter will power off and then on
- 2, This settings and control of CLS can not accessible to customer, and it must be authorized and accessed by password.

Communications Media

Document the provisions made for the use of various communication media, and both the inherent characteristics and the design steps made to ensure security and reliability.

Communication mode	Baud rate	Communication object
RS485	9600	Meter and inverter、 collector and inverter
CAN	500K	Battery BMS and inverter
ModBus	38400	Inverter internal communication

The communication mediums of the CLS can be Wired through RS485 interface and are registered by the CLS and inverter, the security and reliability design as following:

1, Internal communication

The short communication between DSP and M3 adopts SCI serial port communication, which has short communication distance and high communication speed. Communication data for CRC check, taking into account the communication speed and data reliability. Inter-chip communication plus real-time communication anomaly detection, strong real-time performance, and fault redundancy capability. The chip uses a dedicated isolated power supply, which has strong anti-interference ability.

2, CLS communication

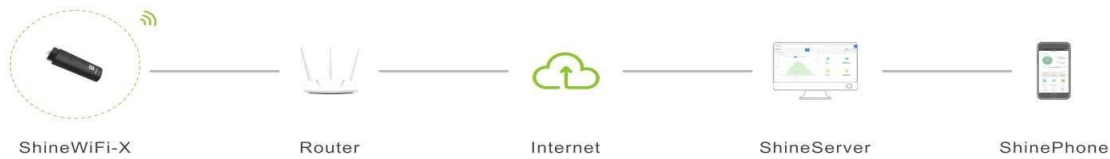
The communication between M3 and the meter adopts 485 differential communications, which has strong anti-interference ability. Communication data for CRC check to ensure data reliability and security. With real-time communication anomaly detection function, strong real-time performance, accurate identification of communication faults, and real-time protection of CLS devices.

Dedicated, high-performance EEPROM stores data, stores data plus CRC check, and has high reliability of data storage. Back up and verify the stored data to further improve the reliability and security of data storage.

Cyber Security

Confirm that the **Manufacturer** or **Installer** of the **CLS** has provided a statement describing how the **CLS** has been designed to comply with cyber security requirements, as detailed in section 4.7.

The following statements declared by Manufacturer



ccc

Name	Meaning	Function	Location
SPA	Hybrid Inverter	Monitor local load conditions, dispatch panel and battery energy	Inverter
Monitoring	WIFI/GPRS/VPP	Monitoring device to realize remote monitoring function	Monitoring device
BAT	Lithium/Lead-acid	Receive dispatch to store excess energy, or discharge to supply load	Energy storage device
Router	Router device	transmission of data to cloud server, reception of commands/settings from external stakeholder	Third-party device
Meter	External Power Meter	meter at the MIN, and possible meter at AC port of third party generator/inverter, for power measures	Third-party device

Subject	Meaning	Operations
End-user	mobile device (App), PC (web portal)	monitoring of historical data, settings for special functions
Service	PC (via web portal)	remote diagnosis, system behaviour monitoring, remote updates, remote settings

2) All communications between internal components of the inverter, and supplied External Power Meter(s), take place via appropriate serial lines (RS485, CanBus) .

3) The only communication port between the inverter and the outside is constituted by the monitoring device on the system; the communication between inverter and the outside world can take place via an Ethernet line, WiFi or GPRS router according to the customer's request.

4) All communications between the Growatt server and the subjects/parties are cyber-protected by SSL technology.

5) The cyber-security assessment of the Growatt was performed according to the ETSI EN 303 645 standard.

Power Quality Requirements

Where the **CLS** includes the power electronics that controls generation or loads (as opposed to the power electronics being included in **Devices** that are subject to their own power quality compliance requirements) please submit the harmonic and disturbance information here as required by EREC G5 and EREC P28.

The CLS does not include the power electronics.

Hybrid inverter will submit to comply with EREC G98 (less than 16A) and EREC G99

Please see separate report for details.

Fail Safe

CLS internal failure: please submit here the description of the internal Fail Safe design and operation. Please also document how it has been demonstrated, including the non-volatile recording of times and numbers of state 2 operations, and confirm the overall response of the CLS to this internal failure.

The energy meter (CLS) will communicate with control device (inverter) via through RS 485 interface, if any part of the energy meter failure, which will return to inverter shown communication fail, Once inverter received communication fail code, it will force into state 3 of fail-safe state and switch off the power to ensure the current does not exceed MEL through the connection point.

If the failure will cause the current temporary exceed the MEL into the state 2 operations, the CLS can also communicate with inverter for recording, the numbers of state 2 and time will record in the ROM of inverter, even if power off or removed, the ROM is still kept in MCU and waiting for inverter to start-up and reading the state again from the ROM.

The inverter will keep in the state 3 operation until the failure is fixed, once fixed then the CLS and inverter immediate reset into the state 1 operation.

Communication and power supply failures between Components and Devices. Please document here compliance with EREC G100 section 5.5.

Component/Device number/description	Communication failure test	Power supply failure test
The energy meter (CLS)	--	Power supply removed (Inverter shown communication failure, which is forced into state 3, if the issue fixed, inverter and CLS immediately reset into state 1 operation)
Inverter	--	MCU of inverter Power supply removed (Inverter shutdown immediately, if the issue fixed, inverter and CLS immediately reset into state 1 operation)
Communication between CLS and inverter	Remove/interrupt communication of RS 485 interface (Inverter shown communication failure, which is forced into state 3, if the issue fixed, inverter and CLS immediately reset into state 1 operation)	--

Operational Tests						
In accordance with EREC G100 section 5.6.undertake the tests A to D to confirm correct operation in state 1 and state 2, that transition into state 3 occurs as required, and that behaviour in state 3 is also as required.						
Test A						
Nominal Export Limit (for type tests this will be at maximum, minimum and one intermediate setting) in Amp:						100%In (7.25A)
Nominal Import Limit (for type tests this will be at maximum, minimum and one intermediate setting) in Amp:						N/A
No	Starting level	Step value	CLS registers change in level?	CLS and/or Component and/or Device initiates correct response of $\geq 5\%$?	Duration of step in test	Correct state 1/ state 2 operation
1	L1: 7.26A L2: 7.15A L3: 7.23A	L1: 7.66A L2: 7.51A L2: 7.58A	Yes, Register in State 2 excursion	Yes	58s	State 1
2	L1: 7.22A L2: 7.20A L3: 7.29A	L1: 7.97A L2: 7.94A L3: 7.97A	Yes, Register in State 2 excursions	Yes	58s	State 1
3	L1: 7.21A L2: 7.30A L3: 7.17A	L1: 8.65A L2: 8.70A L3: 8.52A	Yes, Register in State 2 excursions	Yes	58s	State 1
4	L1: 7.25A L2: 7.15A L3: 7.23A	L1: 7.64A L2: 7.51A L2: 7.58A	Yes, Register in State 2 excursion	Yes	58s	State 1
5	L1: 7.22A L2: 7.21A L3: 7.29A	L1: 7.97A L2: 7.96A L3: 7.97A	Yes, Register in State 2 excursions	Yes	58s	State 1
6	L1: 7.21A L2: 7.30A L3: 7.18A	L1: 8.65A L2: 8.70A L3: 8.54A	Yes, Register in State 2 excursions	Yes	58s	State 1
Test B						
Nominal Export Limit:						7.25A
Nominal Import Limit						N/A

No	Starting level	Step value	CLS registers change in level?	CLS and/or Component and/or Device initiates correct response of \geq 5%?	Duration of step in test	Correct state 3 operation
7	L1: 7.25A L2: 7.19A L3: 7.22A	L1: 7.63A L2: 7.54A L3: 7.58A	Register in state 2 has exceeded 1 minute	Yes (The CLS will continue to drive the output of the Device away from its original set point.)	62s	State 3 (fail safe functionality)
8	L1: 7.25A L2: 7.20A L3: 7.22A	L1: 7.63A L2: 7.56A L3: 7.58A	Register in state 2 has exceeded 1 minute	Yes (The CLS will continue to drive the output of the Device away from its original set point.)	62s	State 3 (fail safe functionality)

State 3 Reset

These tests are to demonstrate compliance with section EREC G100 4.5.2.

Please document how the reset from state 3 to state 1 has been demonstrated. Please include how the reset is achieved.

Please confirm that for **CLSs** to be installed in **Domestic installations** three (3) resets causes lockout or that for non-domestic installations lockout can only be reset after four hours. Please explain how lockout is reset.

When the ROM of inverter had been recorded the following criteria, the inverter will enter into state 3 operation immediately

- 1, A single excursion into state 2 operation that persists for more than 1 minute
- 2, There are more than three excursions (each of more than 10s and less than 1 minute) into state 2 operation in any 24-hour period
- 3, The time between any two consecutive excursions into state 2 operation of greater than 10s is 10 minutes or less (measured from the time of re-entry into state 1 operation from state 2 operation following the first excursion)

If the state 3 is locked out, it should reset by Manufacturers or Installers via remote controlled, or the manufacturers will provide a facility APP to reset.

It should be sent a command to inverter via remote or facility APP to set 1244 of MCU to 0, set 1245 of MCU to 1, the MCU will clear out the records of ROM and exit the state 3 operation.

For CLSs installed in Domestic Installations, 3 resets shall be allowed in any 30 day period. If this criterion is breached the CLS will remain locked in state 3 pending further investigation and resolution of the issues causing the CLS to be locked-out in state 3.

For CLSs installed in non-domestic installations any excursion into state 3 operation shall not be capable of being reset within 4 hours of the start of state 3 operation.

(End of Report)