

# ECM2™

ELECTRONICALLY COMPENSATED METER

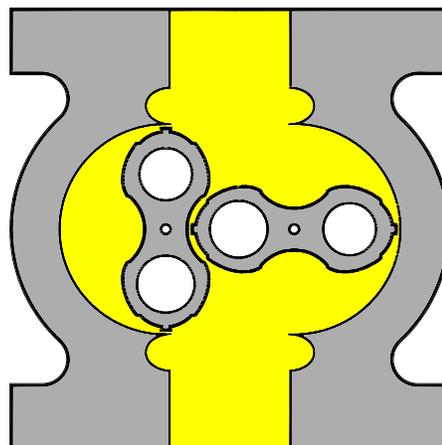
## TECHNICAL MANUAL



**ROMET Limited**

## 1. INTRODUCTION TO ROMET ECM2™ ROTARY GAS METERS

Gas entering the inlet of the rotary meter body produces a differential pressure across the meter,



which causes the two impellers to rotate. Timing gears synchronize the impellers to turn in opposing directions. One complete rotation of the impellers measures four displaced volumes of gas. The outer magnet assembly, mounted to the end of one of the impeller shafts, provides the sensing point for the ECM2™.

## 2. ROMET ECM2™

The ECM2™ is a solid state electronic volume conversion module that is directly coupled to the magnetic housing of the Romet meter body. By employing a solid state sensor to sense the magnetic fields of the outer magnetic, a high resolution volumetric pulse input (three pulses per rotation of the outer magnet or impellers) is supplied to the ECM2™ for the unconverted volume (UNC VOL). The volumetric input pulses are converted to base measurement conditions (COR VOL) by compensating for temperature (live) and pressure (fixed factor) using the following formula:

$$\text{COR} = \text{UNC} \times T_F \times P_{FF}$$

where:  $T_F$  - Temperature Factor

$P_{FF}$  - Fixed Pressure Factor (ratio between measured pressure and base pressure)

The temperature factor  $T_F$  is calculated by the formulas below, with the gas temperature being measured by an IC temperature sensor located in the temperature well or inlet differential port (optional external sensor) of the meter. The optional external sensor location is recommended for mating the ECM2™ module to Romet standard meter bodies that do not have a temperature well.

$$\text{Temperature Factor } (T_F) = \frac{519.67^\circ\text{F}}{459.67^\circ\text{F} + \text{Gas Temperature } ^\circ\text{F}} \quad \text{Base Temperature of } 60^\circ\text{F}$$

(IMPERIAL)

$$\text{Temperature Factor } (T_F) = \frac{273.15^\circ\text{C}}{273.15^\circ\text{C} + \text{Gas Temperature } ^\circ\text{C}} \quad \text{Base Temperature of } 0^\circ\text{C}$$

(METRIC)

$$\text{Temperature Factor } (T_F) = \frac{288.15^\circ\text{C}}{273.15^\circ\text{C} + \text{Gas Temperature } ^\circ\text{C}} \quad \text{Base Temperature of } 15^\circ\text{C}$$

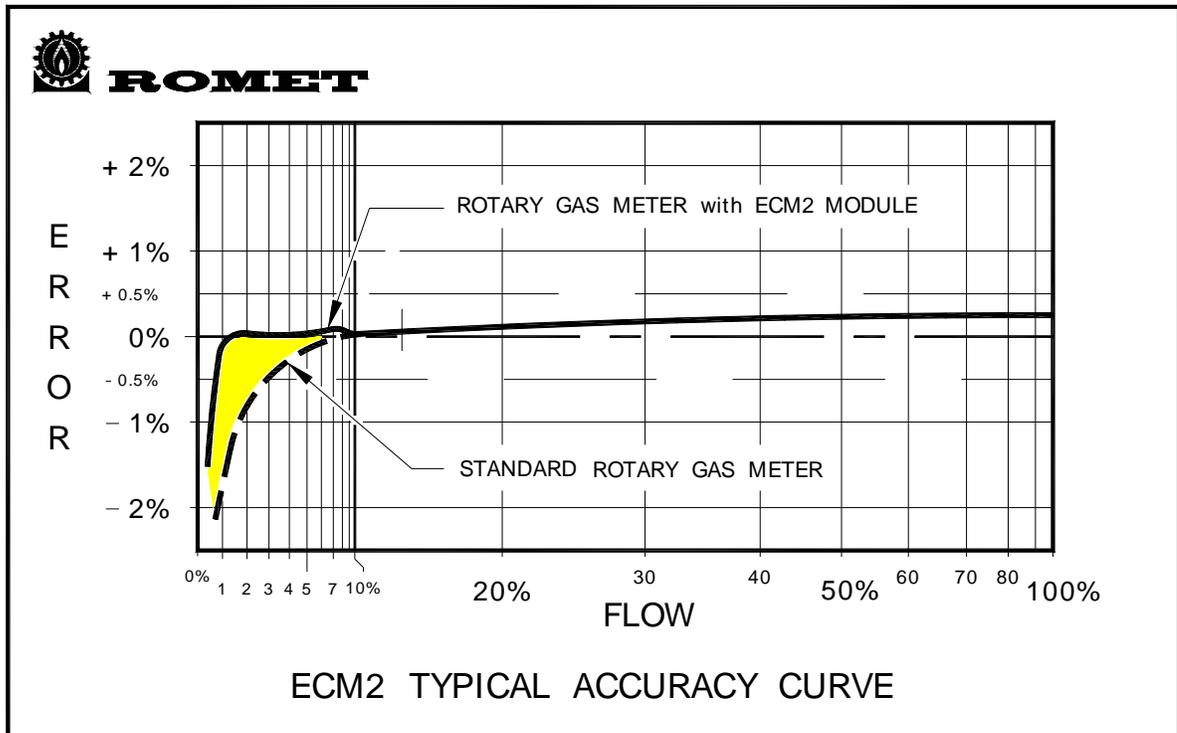
(METRIC)

$$\text{Temperature Factor } (T_F) = \frac{293.15^\circ\text{C}}{273.15^\circ\text{C} + \text{Gas Temperature } ^\circ\text{C}} \quad \text{Base Temperature of } 20^\circ\text{C}$$

(METRIC)

The parameter values that are integrated by the algorithms of the ECM2™ firmware (UNC VOL, COR VOL, flow rate, date, time, etc.) are displayed on a seven segment liquid crystal display (upper display). The associated parameter description is provided on a second, dot matrix display (lower display).

A non-volatile EEPROM memory stores key parameter values, the ECM2™ Set Up configuration and temperature sensor calibration, in the event of power loss. In addition to compensating for live temperature conditions, the ECM2™ has a low flow volumetric linearization feature that enhances the rangeability of the Romet meter to 200:1 with an error of less than  $\pm 1.0\%$ . This feature is automatically initiated at flow rates below 10% of the Qmax rating for the meter.



The ECM2™ program has seven operating modes (refer to the Appendix, Modes of Operation):

1. **Normal Display Mode**
2. **Custom Display Mode**
3. **Set Up Mode**
4. **Full Display Mode**
5. **Proving Mode**
6. **TC Test Mode**
7. **Calibration Mode**

Accessing and programming the operating modes is performed with four buttons, located on the front of the ECM2™ module:

1. **ESC** wake ups the ECM2™ when in Normal Mode or escapes from a menu item or mode.
2. **↑** scroll up
3. **↓** scroll down
4. **ENT** access a mode, menu item, or registers a selected value

Security protection against unauthorized access to the metrological programming of the ECM2™ is assured by the combination of a password and sealable program switch. The intrinsically safe (CSA and UL approved) power supply is produced by an alkaline or lithium battery pack.

### 3. GETTING STARTED

The ECM2™ is supplied by Romet, calibrated and preprogrammed to the specifications of each customer. The only exception would be in the case of a loose ECM2™ module, for which some of the Set Up parameters may need to be programmed. The ECM2™ will be operating in Normal Display Mode when removed from the factory box (**note**: when removing a loose ECM2™ modules from box, never lift by the Input Sensor, P/N 34-124-0 or Temperature Sensor & Cable Assembly, P/N 34-502-0). When in Normal Display Mode, the upper display will show the value for the converted (COR VOL) volume and the lower display will be off. The **ESC** button can be pressed to wake up the ECM2™ and view the first parameter of the Custom Display. The ↑ ↓ buttons may be pressed to scroll through the other parameter values in the Custom Display Mode. The **ENT** button may be pressed at any time in the Custom Display Mode to access the other operating modes, starting with the Set Up Mode. Once at the Set Up Mode, press the ↑ ↓ button to locate the other operating modes, followed by the **ENT** button to access the selected operating mode. Some of the operating modes require that a password (refer to Section 4, Security) be entered before gaining access. At anytime the **ESC** can be pressed to return to the Normal Display Mode.

Listed below is a brief description of the seven operating modes for the ECM2™:

### **NORMAL DISPLAY MODE**

In Normal Display Mode, the ECM2™:

- processes the unconverted volumetric input pulses and, at a specific volumetric interval:
- measures the gas temperature
- converts the unconverted volume to the base measurement conditions
- adds the unconverted and converted volumes to the appropriate registries
- generates the volumetric output pulses (COR VOL, UNC VOL and/or alarm).

Depending on the selection made in the Set up Mode under "SET NORM DISPLAY" either the COR or UNC VOL will appear on the upper window. The lower display remains off.

While in Normal Display Mode, a live flow rate can be displayed by pressing the **ENT** button. The display will automatically revert back to the Normal Display after 45 seconds. This feature replaces "clocking" the meter in order to determine the flow rate. Access is not protected by password or program switch.

If nothing appears on upper display, an alarm condition exists (refer to Alarms, Section 8).

### **CUSTOM DISPLAY MODE**

The Custom Display Mode allows the user to view a selected number of parameters from the Full Display. The Custom Display is selected in the Set Up Mode under "SET CUST DISPLAY". To enter Custom Display Mode, Simply press the **ESC** button when in the Normal Display Mode. By pressing the ↑ ↓ buttons any additional parameters in the Custom Display can be viewed. Access is not protected by a password or by the program switch.

### **SET UP MODE**

The Set Up Mode allows the user to alter the configuration of the ECM2™ from the preprogrammed factory defaults (refer to Section 5, Set Up Mode). Access to this mode is protected by a password and sealable program switch (refer to Section 4, Security).

### **FULL DISPLAY MODE**

The Full Display Mode provides a complete menu of all the parameters that are stored by the ECM2™. Access is not protected by a password or by the program switch.

### **PROVING MODE**

The Proving Mode permits the accurate and efficient proving of the Romet Meter by providing a precise, selectable pulse output (refer to Section 6, Proving). The output defaults to m<sup>3</sup> or cf, based on the meter type entered (metric or imperial) in the "SET METER TYPE" menu of the Set Up Mode. Since the Proving Mode allows the user to select a reduced pulse weight than would be available with a comparable mechanical module, the test volume can be reduced by as much as 90%. Access to this mode is protected by a password (refer to Section 4, Security).

### **TC TEST MODE**

The TC Test Mode verifies the accuracy of the temperature sensor and compensated volume (refer to Section 7, TC Testing and Calibration). In addition, the TC Test Mode checks the functionality of several key program routines of the ECM2™ and therefore, could be considered a diagnostic test. Access to this mode is protected by a password (refer to Section 4, Security).

### **CALIBRATION MODE**

The Calibration Mode allows the user to calibrate the accuracy of the ECM2™ temperature sensor (refer to Section 7, TC Testing and Calibration). After accessing this mode, a live temperature value is displayed for comparison with a reference temperature value. Calibration is performed at a single point due to the linearity of the ECM2™ temperature sensor. Access to this mode is protected by a password and sealable program switch (refer to Section 4, Security).

**Note:** The reference temperature value selected must be a positive (+) value.

## **4. SECURITY**

The ECM2™ provides two levels of security to protect against unauthorized access.

### **PASSWORD**

Access to the Set Up Mode, Proving Mode, Calibration Mode, and TC Test Mode requires a password to be entered (the word "Password" appears on the lower display). The password is a four digit number (default value of 2121 or pre-customized) that is entered in the following manner:

			<u>PASSWORD</u>
Press	↑	scroll button twice	2
Press	<b>ENT</b>	button to move to the next digit	
Press	↑	scroll button once	1
Press	<b>ENT</b>	button to move to the next digit	
Press	↑	scroll button twice	2
Press	<b>ENT</b>	button to move to the next digit	
Press	↑	scroll button once	1
Press	<b>ENT</b>	button to complete the password	

Since the password is permanently burnt into the EEPROM memory of the ECM2™, it cannot be changed, except by installing a new microprocessor chip with the revised password code. Therefore, the password must be specified at the time of ordering.

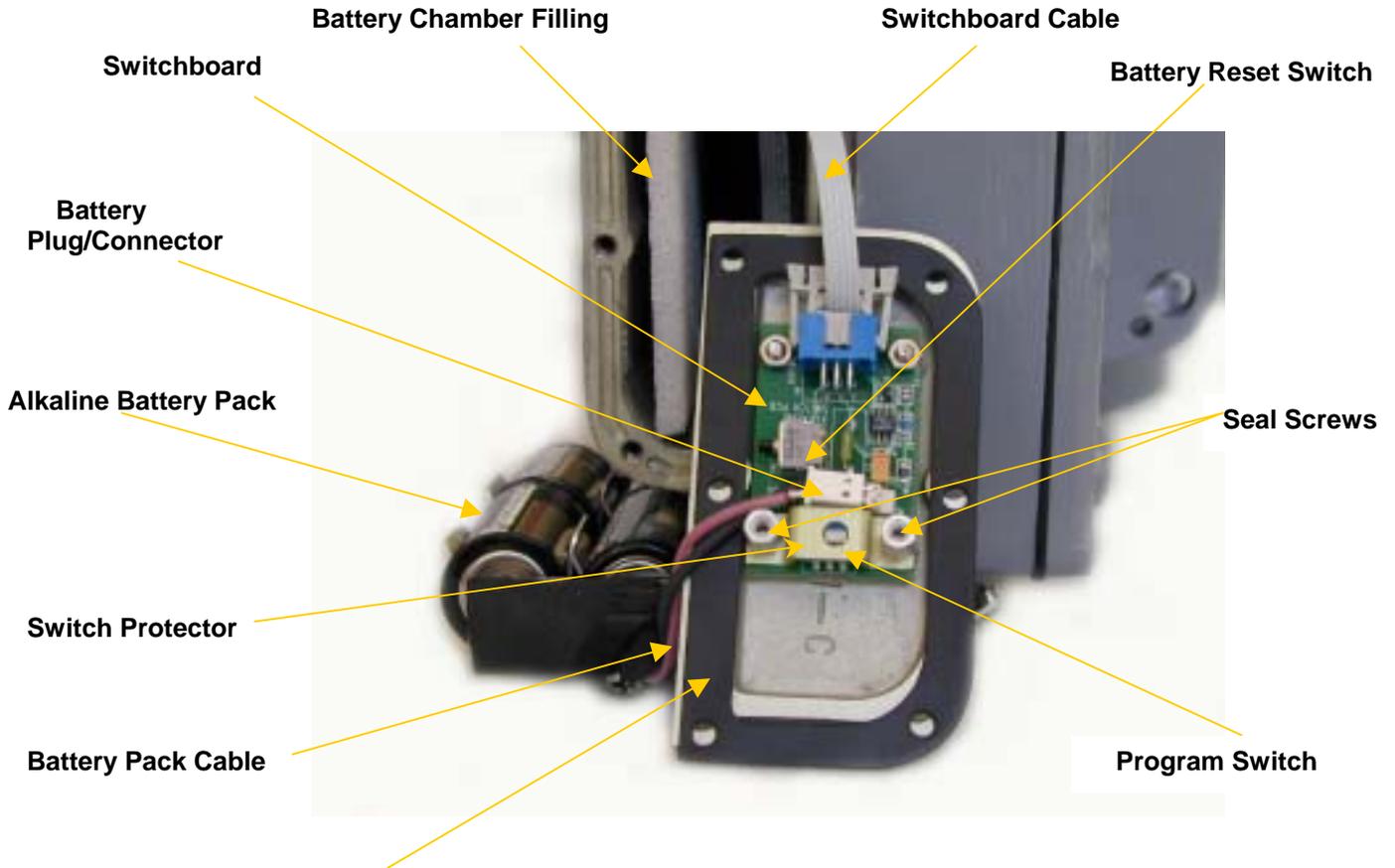
### **PROGRAM SWITCH**

The ECM2™ sealable program switch is mounted on the switchboard, which is secured to the battery compartment lid, located at the end of the ECM2™ module (refer to the photographs on Pages 5 and 6). In the "off" position, the switch cover is installed and sealed (with two sealable screws plus wire seal), access to the Calibration Mode and most of the Set Up Mode is

prevented, even after entering a password. In the case of the Set Up Mode, the only accessible menu items are:

**SET DATE D/M/Y**  
**SET TIME H/M/S**  
**CLEAR TEMP ALARM**  
**RESET PEAK FLOW**  
**SET CUSTOM DISPLAY**

### Alkaline Battery Compartment Lid



### **Battery Compartment Gasket**

#### **Procedures to access Calibration and Set Up Modes:**

Parts and Tools required (refer to Appendix, Spare Parts)

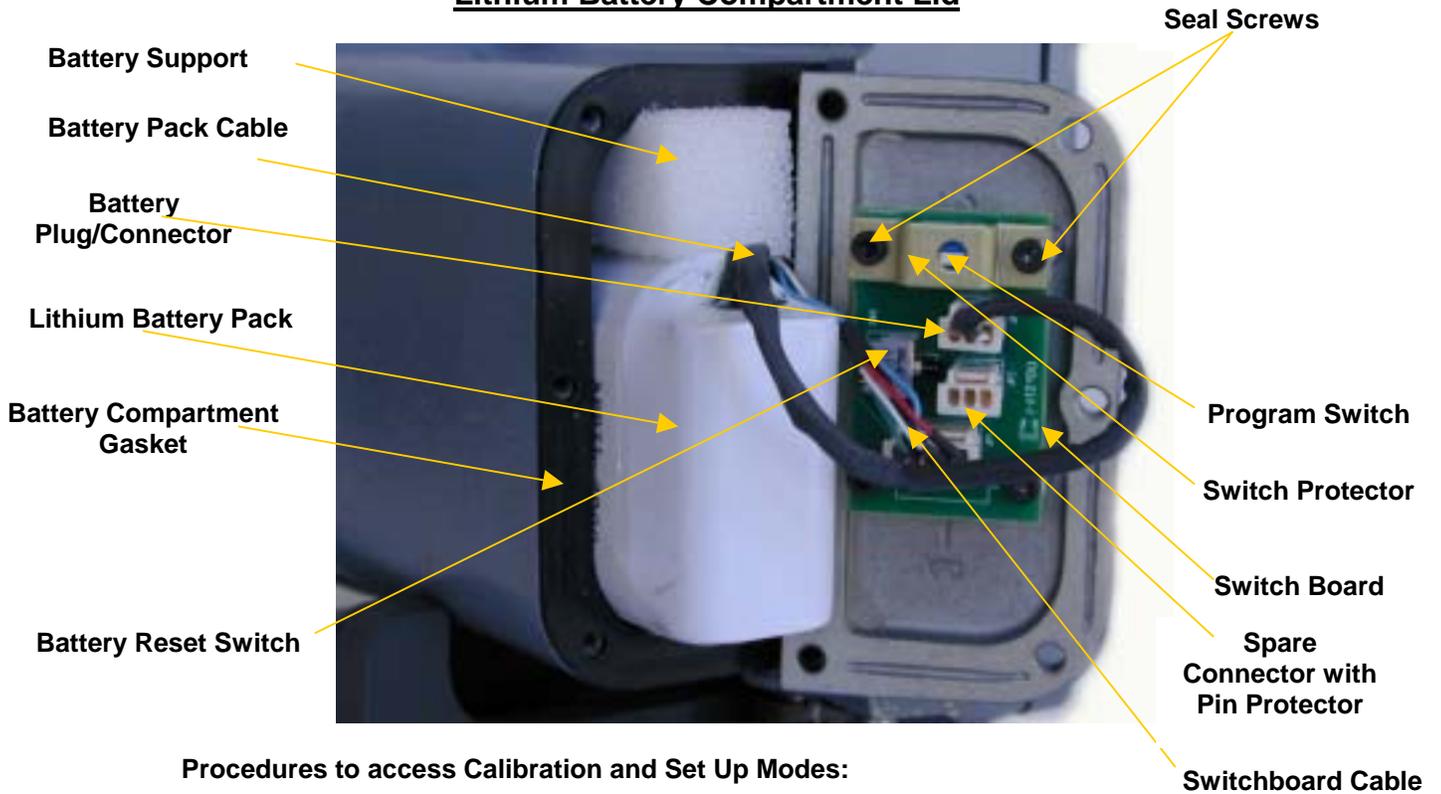
- Screwdriver Phillips No. 2
- Allen Key  $\frac{3}{16}$ " or 5mm
- Romet Battery Compartment Gasket P/N 34-133-7

1. Clean the battery compartment lid area
2. Remove (6) screws that secure battery compartment lid to ECM2™ module.
3. Discard battery compartment gasket.
4. Remove the two seal screws and switch protector, along with any wire seal.
5. Move program switch to "on" position.
6. Access to Calibration and Set Up Modes is now available.

**To prevent access to the Calibration and Set Up Modes:**

1. Move program switch to the "off" position.
2. Install switch protector and two seal screws along with wire seal (if applicable).
3. Clean gasket contact areas
4. Install new battery compartment gasket.
5. Install (6) screws that secure battery compartment lid to ECM2™ module.

**Lithium Battery Compartment Lid**



**Procedures to access Calibration and Set Up Modes:**

Parts and Tools required (refer to Appendix, Spare Parts)

- Screwdriver Phillips No. 2
  - Allen Key  $\frac{3}{16}$ " or 5mm
  - Romet Battery Compartment Gasket P/N 34-133-7
1. Clean battery compartment lid area, if necessary.
  2. Remove (6) screws that secure battery compartment lid to ECM2™ module.
  3. Discard battery compartment gasket.
  4. Remove the two seal screws and switch protector, along with any wire seal.
  5. Move program switch to "on" position.
  6. Access to the Calibration and Set Up Modes is now available.

**To prevent access to the Calibration and Set Up Modes:**

1. Move program switch to the "off" position.
2. Install switch protector and two seal screws along with wire seal (if applicable).
3. Clean gasket contact areas, if necessary
4. Install new battery compartment gasket.
5. Install (6) screws that secure battery compartment lid to ECM2™ module.

**5. SET UP MODE**

The Set Up Mode is employed to alter the factory default configuration of the ECM2™ program parameters to match the individual specification of each customer. The ECM2™ meter would normally be shipped from Romet with the Set Up configuration fully programmed to a customer's specifications. The exception would be an order for a loose ECM2™ module where "SET METER TYPE" and some of the associated parameters in the Set Up Mode may need to be programmed by the customer during the installation of the ECM2™ module to the meter body. Access to Set Up Mode is protected by a sealable program switch and a password (refer to Section 4, Security). The following program flow chart is a guide to the Set Up Mode. The arrow symbols in the flow chart signify the use of the ECM2™ buttons to move through the program menus:

→    **ENT** button  
↑↓    ↑↓ buttons

## 6.    **PROVING**

In order to access the Proving Mode, a password must be entered when prompted. Once the Proving Mode has been entered, the upper display will indicate the minimum pulse weight (1CF or 0.01m<sup>3</sup>) and the lower display will show "PULSE VALUE". The scrolling buttons ↑ ↓ can be pressed to view the other available pulse weights, followed by the **ENT** button to register the desired pulse weight. The ECM2™ is ready for proving if the upper display indicates the selected pulse weight and the lower display shows "PROVING MODE". Where possible, the minimum pulse weight should be employed to minimize the test volume and time.

During the proof test, the ECM2™ will indicate in the middle of the upper display a " : ", signifying the output duration of each volumetric pulse to the proving system. This means "ON" for one pulse and "OFF" for one pulse. Proving should be performed as quickly as possible to conserve battery life. Proving Mode will time out after two hours and automatically return to the Normal Display Mode.

**Note: After completing the proving of an ECM2™ meter, return the module to Normal Display Mode by pressing the ESC button twice.**

The accuracy of the ECM2™ can be checked on a variety of proving systems.

### **Bell Prover**

Since bell prover systems have a finite displacement, the ECM2™ provides a selectable pulse output resolution in the Proving Mode. In order to utilize this mode, the bell prover system being employed must be capable of accepting a high-speed pulse input from the ECM2™ (5 ms pulse width).

### **Transfer Prover**

Depending on the transfer prover being employed to test the ECM2™ meter, the procedure will vary accordingly. In order to utilize this mode, the transfer prover system being employed must be capable of accepting a high-speed pulse input from the ECM2™ (5 ms pulse width).

### **Dresser No. 5 Prover**

A Romet cable assembly (Romet P/N 34-097-45) is available to connect the pulse output (standard 6 pin Cannon) of the ECM2™ to the Dresser No. 5 Prover. Other cable assemblies are available to accommodate different pin arrangements and other connector types. Please contact Romet for assistance.

The following procedures can be followed for testing Romet ECM2™ meters:

#### **RM Imperial ECM2™ Meters:**

1. Install the appropriate flange connections to the ECM2™ meter with the proper hose connections.
2. Connect the ECM2™ to the interface box on the prover with the appropriate Romet cable connector assembly.
3. Access the Test Configuration menu and set the test parameters as follows:

#### RM2000

Prover: 2M  
Test connection: opto  
Meter output: UNC  
Pulse/test: select 50  
Test volume: select 50  
ECM2™ pulse 1 cf

#### RM3000

Prover: 10M  
Test connection: opto  
Meter output: UNC  
Pulse/test: select 50  
Test volume: select 50  
ECM2™ pulse 1 cf

#### RM5000 to RM11000

Prover: 10M  
Test connection: opto  
Meter output: UNC  
Pulse/test: select 10  
Test volume: select 100  
ECM2™ pulse 10 cf

#### RM16000 to RM23000

Prover: 10M  
Test connection: opto

Meter output: UNC  
Pulse/test: select 10  
Test volume: select 1000  
ECM2™ pulse 100 cf

The remainder of the test configuration menu can be completed in the normal manner.

4. Perform the proof test with ECM2™ in the Proving Mode, selecting the necessary pulse rate to match the prover test configuration.  
Disconnect the Romet cable assembly and flange connections after completing the test.  
The remainder of the Test Configuration menu can be completed in the normal manner .
5. Perform the proof test in the normal manner with ECM2™ in Normal Display Mode.
6. Disconnect the Romet cable assembly and the flange connections after completing the test.

#### **RM & G Metric ECM2™ Meters:**

1. Install the appropriate flange connections to the ECM2™ meter for the proper hose connections.
2. Connect the ECM2™ to the interface box on the prover with a Romet cable assembly.
3. Access the Test Configuration menu and set the test parameters as follows:

<u>RM55/G40</u>	<u>RM85 to RM200/G65 to G100</u>	<u>RM300 to RM650/G250 to G400</u>
Prover: 2M	Prover: 10M	Prover: 10M
Test connection: opto	Test connection: opto	Test connection: opto
Meter output: UNC	Meter output: UNC	Meter output: UNC
Pulse/test: select "enter" and key in 10	Pulse/test: select "enter" and key in 10	Pulse/test: select 10
Test volume: select 1 ECM2™ pulse 0.1m <sup>3</sup>	Test volume: select 100 ECM2™ pulse 0.1m <sup>3</sup>	Test volume: select 10 ECM2™ pulse 1m <sup>3</sup>

The remainder of the test configuration menu can be completed in the normal manner.

7. Perform the proof test with ECM2™ in the Proving Mode, selecting the corresponding pulse rate to match the prover test configuration.
8. Disconnect the Romet cable assembly and flange connections after completing the test.

## **7. TC TESTING AND CALIBRATION**

The ECM2™ measures the gas temperature with an IC thermal sensor which is both very accurate ( $\pm 0.5$  °F/ 0.25°C) and linear throughout the operating range of -40°F to 149°F or -40°C to 65°C. Therefore, it is important to ensure that the temperature standard that are employed in testing or calibrating the ECM2™ have a better resolution and accuracy.

### **TC TEST MODE**

The TC Test Mode provides a live temperature value that can be referenced to a temperature standard. The probe for the temperature standard should be located as close as possible to the temperature well of the meter. The installation of a pressure access plug in the inlet differential port of the meter will permit the insertion of the probe for the temperature standard. If the temperature value of the ECM2™ and temperature standard are substantially different (>1°F or 0.6°C), calibrate the ECM2™ (refer to the Calibration section below).

The TC Test Mode also provides a verification of the temperature conversion (TC) accuracy of the ECM2™. Press the **ENT** button to access the TC Test Mode and enter the password when prompted (refer to Section 4, Security). The ECM2™ will display a temperature factor ( $T_F$ ) equivalent for the ECM2™ after a test interval equaling 1000 revolutions of the meter impellers. The temperature sensor remains live throughout the test to permit the calculation of the TC after each complete rotation of the meter impellers. The ECM2™  $T_F$  can be compared with the theoretical temperature factor, (theoretical  $T_F$ ) calculated from the temperature standard, employing the appropriate formula on Page 1.

Using the formulas below, the following values can be calculated:

$$\% \text{ Error} = \frac{\text{Theoretical } T_F - \text{ECM2}^{\text{TM}} T_F}{\text{Theoretical } T_F} \times 100 \text{ [ \% ]}$$

$$\% \text{ Proof} = \frac{\text{Theoretical } T_F}{\text{ECM2}^{\text{TM}} T_F} \times 100 \text{ [ \% ]}$$

$$\% \text{ Accuracy} = \frac{\text{ECM2}^{\text{TM}} T_F}{\text{Theoretical } T_F} \times 100 \text{ [ \% ]}$$

## CALIBRATION

Remove carefully the ECM2™ temperature sensor from the meter body (**note**: never pull out the white polyethylene plastic tube, P/N 0656 while adjusting the temperature sensor & cable assembly length). Place the temperature sensor into a stable temperature bath and stabilized for at least 5 minutes. Calibration is performed at a single test point due to the linearity and accuracy of the sensor. To achieve the best results, calibration should be performed at a reference bath temperature of 50-60°F / 10-16°C.

**Note:** The reference temperature must be a positive (+) value.

In order to access the Calibration Mode, the program switch in the battery compartment must first be moved to the "on" position (refer to Section 4, Security) and the password is required when prompted. Once accessed, the Calibration Mode will display a live temperature value. By pressing the scroll buttons  $\uparrow$   $\downarrow$ , the temperature value displayed by the ECM2™ can be adjusted in 0.1°F/°C increments until the value matches that of the temperature standard ( $\pm 0.5^\circ\text{F}/0.25^\circ\text{C}$ ). Pressing the **ENT** button will register the value. Since the temperature displayed on the ECM2™ is no longer live when either of the scroll buttons are pressed, check that the live temperature value displayed in Calibration Mode matches the reference temperature value.

After completing the calibration of the ECM2™, return the program switch to the "off" position and follow procedures in Section 4, Security, to prevent access to the Calibration Mode and most of the Set Up Mode.

## 8. ALARMS

In the case of an alarm occurring, the upper display will turn "off" while in Normal Display Mode. If the **ESC** button is pressed, the lower display on the ECM2™ will indicate one of the alarm conditions listed below. If both displays remain "off" after pressing the **ESC** button, most likely the battery have expired and require replacement as outlined in Section 10, Battery Replacement.

### TEMPERATURE MALFUNCTION

This alarm condition occurs if the ECM2™ temperature sensor has malfunctioned. If this condition occurs, the alarm pulse output is activated, the COR VOL pulse output is disabled and the UNC VOL output pulse continues to operate. The COR VOL and UNC VOL, along with the DATE and TIME are stored and displayed in the Full Display as:

LAST COR  
LAST UNC  
LAST STORED DATE  
LAST STORED TIME

The ECM2™ starts a new registry for the UNC VOL that is displayed in the Full Display as “UNC SINCE MALF”. The COR volume since the temperature malfunction can be calculated by applying an estimated temperature factor to the “UNC SINCE MALF” value.

After a temperature sensor malfunction, an estimation of the current COR VOL and UNC VOL can be calculated as follows:

**For UNC VOL:**

$$\text{LAST UNC} + \text{UNC SINCE MALF} = \text{Current UNC}$$

**For COR VOL:**

$$\text{LAST COR} + (\text{estimated } T_F \times \text{UNC SINCE MALF}) = \text{Estimated Current COR}$$

Note: The temperature correction factor  $T_F$  value can be calculated using the equation from Section 2 (gas temperature would be estimated).

The COR VOL and UNC VOL registries of the ECM2™ can be programmed to the above current values in the Set Up Mode with the menu items “SET UNC” and “SET COR”. Access to this portion of the Set Up Mode will require moving the program switch to the “on” position (refer to Section 4, Security).

The temperature sensor must be replaced by following the procedure in Section 9.

**COMPUTER MALFUNCTION**

This alarm indicates a failure of one of the ECM2™ microprocessor chips. The last hourly UNC and COR volumes can be recovered in some cases. Please return the ECM2™ to Romet Limited.

**BATTERY ALARM**

This alarm condition occurs if the REMAINING MONTHS shown in the Full Display is 3 months or less (alkaline batteries) or 7 months or less (lithium battery pack). In this alarm condition, the ECM2™ continues to register the COR VOL and UNC VOL and generate the associated volumetric pulse outputs. The upper display is turned "off" and the alarm pulse output is activated. The date that the low battery alarm was activated can be retrieved in the Full Display under the menu item “BAT ALARM DATE”. The battery can be replaced as outlined in Section 10, Battery Replacement (alkaline batteries) or Section 12, Battery Replacement (lithium battery pack).

If the batteries have expired (refer to Section 11, Troubleshooting Alkaline Battery Version) or Section 13, Troubleshooting Lithium Battery Version), the following information can be retrieved from the non-volatile EEPROM memory of the ECM2™:

- LAST STORED DATE
- LAST STORED TIME
- LAST COR \*
- LAST UNC \*

The following calculation can be employed to estimate the current values for the COR VOL and UNC.

**For UNC VOL:**

$$\text{LAST UNC} + \text{estimated UNC since LAST STORED DATE} = \text{estimated current UNC}$$

**For COR VOL:**

LAST COR + estimated COR VOL since LAST STORED DATE = estimated Current COR

Note: The temperature correction factor  $T_F$  value can be calculated using the equation from Section 2 (gas temperature would be estimated).

The COR VOL and UNC VOL registries of the ECM2™ can be programmed to the above current estimated values in the Set Up Mode with the menu items "SET UNC" and "SET COR". Access to this portion of the Set Up Mode will require moving the program switch to the "on" position (refer to Section 4, Security).

## 9. TEMPERATURE SENSOR REPLACEMENT

In the event that the IC temperature sensor fails, the following procedure may be employed to replace the sensor. This procedure should be performed in a clean, dry antistatic work area (refer to the Appendix, ECM2™ Interface Board Connections).

Parts and Tools required (refer to the Appendix, Parts List)

- Screwdriver Phillips No. 2
- Screwdriver Flat  $\frac{1}{16}$ " blade
- Allen key - Imperial:  $\frac{3}{16}$ " or Metric: 5 mm
- Electronic Compartment Gasket P/N 34-133-6
- Temperature Sensor P/N 34-502-0
- Wire Ferrule (3) 2029
- Module Gasket (Housing) P/N 34-140-1

1. Clean the ECM2™ module area.
2. Remove the (2) seal screws, (2) cap screws, and (4) lock washers that secure the ECM2™ module to the meter.
3. Set the cap screws and lock washers aside.
4. Remove the ECM2™ from the meter and set the meter aside.
5. Discard the module gasket.
6. Remove the temperature sensor clamp and set it aside.
7. Remove the (8) Phillips screws that secure the front lid of the ECM2™ enclosure
8. Set the screws aside.
9. Remove the front lid and discard the gasket behind the lid.

**Note: Do not disconnect the ribbon cable between Mother Board and Interface Board**

10. Loosen the (3) terminal screws for the temperature sensor cable.
11. Pull the (3) wire leads for sensor cable out of the terminal strip and cut the wire ferrule off.
12. Remove sensor from the ECM2™ by pulling the sensor cable out through the white polyethylene plastic tube.
13. Install a new sensor, reversing the process for steps 12 to 1.

**Notes: Install the front lid with a new electronic compartment gasket.**

**Take care not to pull out the white polyethylene plastic tube (P/N 0656) when pulling the temperature sensor cable out to install the probe in the meter temperature well.**

14. Leak test the ECM2™ after installing the module on the meter body:
  - a) Remove the  $\frac{1}{4}$ " NPT Allen pressure test plug.
  - b) Connect a low pressure (5 psig / 0.35 bar), dry compressed air supply to the  $\frac{1}{4}$ " port on the bottom of the ECM2™ enclosure (beside the pulse output connector).
  - c) Apply air pressure and leak test the front lid by applying a surfactant (e.g. soapy water) to the seams.
  - d) Install the  $\frac{1}{4}$ " NPT Allen pressure test plug, use non-metallic compound pipe thread sealant.
  - e) Dry off the module.
15. Enter the Set Up Mode and scroll to "CLEAR TMP ALARM".
16. Press the **ENT** button to clear the alarm. The lower display will show the next menu item in the Set Up Mode to signify that the alarm has been cleared. Press the **ESC** button

twice to return to Normal Display Mode. The upper display should be showing the value for the COR VOL if the alarm has been cleared.

17. Calibrate the temperature sensor as per the procedure in Section 7, TC Testing and Calibration.

## 9. BATTERY REPLACEMENT (ALKALINE BATTERY VERSION)

Parts and tools required (refer to Appendix, Spare Parts):

- (6) "C" cell alkaline batteries
  - Romet Battery Compartment Gasket P/N 34-133-7
  - Phillips No. 2 screwdriver
  - Allen key - Imperial:  $\frac{3}{16}$ " or Metric: 5mm
1. If the ECM2™ is operating properly in the Normal Display Mode (COR VOL displayed on the upper display), continue with the procedure, starting with step 3. If both displays are off, press the **ESC** button and continue to step 2.
  2. If the lower display shows "LOW BATTERY ALARM", continue with step 3. If the lower display does not turn on or shows "TEMPERATURE MALF" go to Section 11, Troubleshooting Guide part a. If the lower display shows "COMPUTER MALF", remove the ECM2™ from service and return it to Romet for service.
  3. Clean the battery compartment lid area.
  4. Remove the sealing wire, if applicable, and the (6) screws that secure the battery compartment lid.
  5. Remove the lid and discard the gasket.
  6. Press the battery reset button on the switchboard to store the UNC and COR VOL values in the ECM2™'s non-volatile EEPROM memory. The lower display of the ECM2™ will show "SAVED".
  7. Remove the battery holder from the battery compartment.  
**Note: Take care not to pull on the cables for the battery pack or switchboard.**
  8. Disconnect the plug for the battery holder from the socket on the switchboard, located on the back of the battery compartment lid (refer to the photograph on Page 5).  
**WARNING!**  
**THE REMOVAL AND INSTALLATION OF THE ALKALINE BATTERIES SHOULD BE PERFORMED WITH THE BATTERY HOLDER LOCATED AT A SAFE DISTANCE FROM GAS INSTALLATION (NON-HAZARDOUS AREA).**
  9. Remove the old batteries.
  10. Install (6) new "C" cell alkaline batteries in the battery holder.  
**Note: The battery power should be restored in under 5 minutes to avoid loosing the electronic clock in the ECM2™.**
  11. Install the battery holder (position the bottom of the holder towards the back of ECM2™) in the battery compartment by putting the battery chamber filling between the switch board cable and the topside of the holder (make sure that the cables are placed securely inside the ECM2™ battery compartment).
  12. Reconnect the battery holder plug to the socket on the switchboard.
  13. Press the reset button on the switchboard to clear the low battery alarm. The ECM2™ display will show "BAT INSTALL DATE" on the lower display and the current date on the upper display.
  14. Press the **ESC** button and the display will return to the Normal Display Mode. The upper display should be showing the value for the COR VOL since the alarm has been cleared.
  15. Clean the gasket area and install a new battery compartment lid gasket.
  16. Tighten the (6) screws securely.
  17. Install a new sealing wire, if required.

## 10. BATTERY REPLACEMENT (LITHIUM BATTERY VERSION)

Parts and tools required (refer to the Appendix, Spare Parts):

- Romet Battery Pack P/N 34-092-0
- Romet Battery Compartment Gasket P/N 34-133-7
- Romet Vapor Capsule P/N 6000

- Phillips No. 2 screwdriver
  - Allen key - Imperial:  $\frac{3}{16}$ " or Metric: 5mm
1. If the ECM2™ is operating properly in the Normal Display Mode (COR VOL displayed on the upper display), continue with the procedure, starting with step 3. If both displays are off, press the **ESC** button and continue to step 2.
  2. If the lower display shows "LOW BATTERY ALARM", continue with step 3. If the lower display does not turn on, go to Section 12, Troubleshooting Guide part a. If the lower display shows "TEMPERATURE MALF", go to Section 12, Troubleshooting Guide part b. If the lower display shows "COMPUTER MALF", remove the ECM2™ from service and return it to Romet for servicing.
  3. Clean battery compartment lid area.
  4. Remove the sealing wire, if applicable, and remove the (6) screws that secure the battery compartment lid.
  5. Remove the lid and discard the gasket.
  6. Press the battery reset button on the switchboard to store the UNC and COR VOL values in the ECM2™'s EEPROM non-volatile memory. The lower display of the ECM2™ will show "SAVED".
  7. Remove the old battery pack and set it aside for proper disposal. Retain the battery support foam from the battery compartment for the installation of the new battery pack.  
**Note: Take care not to pull on the cables for the battery pack or switch board.**
  8. Disconnect the battery plug from the socket on the switchboard, located on the back of the battery compartment lid (refer to the photograph on Page 6).
  9. Install a new vapor capsule on the new battery pack.
  10. Connect the plug for the new battery pack to the connector on the switchboard.
  11. Install the new battery pack, with the battery support foam, into the ECM2™ battery compartment.
  12. Press the reset button on the switchboard to clear the low battery alarm. The ECM2™ display will show "BATT INSTALL DATE" on the lower display and the current date on the upper display.
  13. Press the **ESC** button to return to the Normal Display Mode. The upper display should be showing the value for the COR VOL since the alarm has been cleared.
  14. Clean the gasket area.
  15. Install a new battery compartment lid gasket and tighten the (6) screws securely.
  16. Install a new sealing wire, if required.

## 11. TROUBLESHOOTING (ALKALINE BATTERY VERSION)

### a) LOWER DISPLAY WILL NOT TURN ON AFTER PRESSING THE ESC BUTTON IN THE NORMAL DISPLAY

1. Clean the battery compartment lid area.
2. Remove the sealing wire, if required, and remove the (6) screws that secure the battery compartment lid.
3. Remove the lid and discard the gasket.
4. Remove the battery holder from the battery compartment.  
**Note: Do not press the battery reset button.**  
Disconnect the battery holder plug from the socket on the switchboard, located on the back of the battery compartment lid (refer to photograph on Page 5).  
**WARNING!**  
**THE REMOVAL AND INSTALLATION OF THE ALKALINE BATTERIES SHOULD BE PERFORMED WITH THE BATTERY HOLDER LOCATED AT A SAFE DISTANCE FROM GAS INSTALLATION (NON-HAZARDOUS AREA).**
5. Remove the old batteries.
6. Install (6) new "C" cell alkaline batteries in the battery holder.
7. Install the battery holder (position the bottom of the holder towards the back of ECM2™) in the battery compartment by putting the battery chamber filling between the switch board cable and the topside of the holder (make sure that the cables are placed securely inside the ECM2™ battery compartment).
8. Reconnect the battery holder plug to the socket on the switchboard.

9. Press the **ESC** button. If the lower display shows "LOW BATTERY ALARM", continue to step 10. If the lower display remains off or shows "COMPUTER MALF", remove the ECM2™ from service and return it to Romet for servicing. If the lower display shows "TEMPERATURE MALF", discontinue with this procedure and refer to the section b below that addresses a temperature malfunction alarm.
10. Press the **ENT** button. The lower display will show "SET UP". Press the ↓ scroll button once to move to the FULL DISPLAY, followed by pressing the **ENT** button to access the FULL DISPLAY menu.
11. Press the ↑↓ scroll buttons to locate the following menu items and record the values:
  - DATE (D/M/Y)
  - TIME (H/M/S)
  - BAT ALARM DATE
  - LAST COR \*
  - LAST UNC \*
  - LAST STORED DATE
  - LAST STORED TIME
12. If the DATE and TIME are correct, continue to step. If the DATE and TIME are incorrect, continue to step 13.
13. Press the **ESC** button once to exit the FULL DISPLAY menu and press the ↑ scroll button once to move to the SET UP mode.
14. Press the **ENT** button and enter the password (refer to Section 4, Security) when prompted.
15. Press the ↑↓ scroll buttons to locate SET DATE and SET TIME. Enter the correct date and time (refer to Section 5, Set Up Mode).
16. Press the **ESC** button twice to return to the Normal Display Mode.
17. Press the battery reset button and the lower display will show "BATT INSTALL DATE" and the upper display should show the current date.
18. Press the **ESC** button to return to the Normal Display Mode.
19. Check that the COR VOL displayed in the Normal Display Mode closely matches the LAST COR \* that was recorded earlier in the procedure. If the values are significantly different, remove the ECM2™ from service and return it to Romet.
20. Clean the gasket area if necessary.
21. Install new battery compartment lid gasket and tighten the (6) screws securely.
22. Install a new sealing wire, if required.
23. Since the alkaline batteries had expired, the COR and UNC VOL ceased being registered after the LAST DATE and LAST TIME. Refer to Section 8, Alarms, Low Battery Alarm to estimate and program the current COR and UNC VOL for the ECM2™.

**a) Temperature malfunction is displayed when replacing the battery pack**

1. Press the **ENT** button. The lower display will show "SET UP".
2. Press the ↓ scroll button once to move to the FULL DISPLAY.
3. Press the **ENT** button to access the FULL DISPLAY menu.
4. Press the ↑↓ scroll buttons to locate the following menu items and record the values:
  - DATE (D/M/Y)
  - TIME (H/M/S)
  - BAT ALARM DATE
  - LAST COR \*
  - LAST UNC \*
  - LAST STORED DATE
  - LAST STORED TIME
  - UNC SINCE MALF
5. If the DATE and TIME are correct, continue to step 6. If the DATE and TIME are incorrect, continue to step 9.
6. Press the **ESC** button once to exit the FULL DISPLAY menu and press the ↑ scroll button once to move to the SET UP mode.
7. Press the **ENT** button and enter the password (refer to Section 4, Security) when prompted.

8. Press the  $\uparrow\downarrow$  scroll buttons to locate SET DATE and SET TIME. Enter the correct date and time (refer to Section 5, Set Up Mode).
9. Press the **ESC** button twice to return to the Normal Display Mode.
10. Press the battery reset button and the lower display will show "BATT INSTALL DATE" and the upper display should show the current date.
11. Press the **ESC** button to return to the Normal Display Mode.
12. Allow the ECM2™ to operate until the COR VOL changes value. If the upper display remains on, continue to step 14. If the upper display turns off, press the **ESC** button and continue to step 13.
13. If the lower display shows "BATTERY MALF", remove the ECM2™ from service and replace the temperature sensor (refer Section 9, Temperature Sensor Replacement).
14. Clean the gasket area if necessary.
15. Install new battery compartment lid gasket and tighten the (6) screws securely.
16. Install a new sealing wire, if required.
17. The ECM2™ stopped registering the COR VOL when the temperature malfunction alarm was activated. Refer to Section 8, Alarms, Temperature Malfunction to estimate the current COR VOL and UNC VOL and program the correct values in the ECM2™.

## 12. TROUBLESHOOTING (LITHIUM BATTERY VERSION)

### b) LOWER DISPLAY WILL NOT TURN ON AFTER PRESSING THE ESC BUTTON IN THE NORMAL DISPLAY

1. Clean the battery compartment lid area.
2. Remove the sealing wire, if applicable, and the (6) screws that secure the battery compartment lid.
3. Remove the lid and discard the gasket.
4. Remove the battery pack from the battery compartment.  
**Note: Do not press the battery reset button.**
5. Disconnect the battery plug from the socket on the switchboard, located on the back of the battery compartment lid (refer to photograph on Page 6).
6. Set aside the old battery pack for proper disposal and retain the foam battery support for installation with new battery pack.
7. Install a new vapor capsule to the new battery pack.
8. Insert the plug for the new battery pack into the connector on the switchboard.
9. Install the new battery pack with the battery support foam into the ECM2™ battery compartment.
10. Press the ESC button, if the lower display shows "LOW BATTERY ALARM", continue to step 11. If the lower display remains off or shows "COMPUTER MALF", remove the ECM2™ from service and return it to Romet for servicing. If the lower display shows "TEMPERATURE MALF", discontinue with this procedure and refer to the section b below for dealing with a temperature malfunction alarm.
11. Press the **ENT** button. The lower display will show "SET UP". Press the  $\downarrow$  scroll button once to move to the FULL DISPLAY, followed by pressing the **ENT** button to access the FULL DISPLAY menu.
12. Press the  $\uparrow\downarrow$  scroll buttons to locate the following menu items and record the values:  
DATE (D/M/Y)  
TIME (H/M/S)  
BAT ALARM DATE  
LAST COR \*  
LAST UNC \*  
LAST STORED DATE  
LAST STORED TIME
13. If the DATE and TIME are correct, continue to step 17. If the DATE and TIME are incorrect, continue to step 14.
14. Press the **ESC** button once to exit the FULL DISPLAY menu and press the  $\uparrow$  scroll button once to move to the SET UP mode.
15. Press the **ENT** button and enter the password (refer to Section 4, Security) when prompted.

16. Press the ↑↓ scroll buttons to locate SET DATE and SET TIME. Enter the correct date and time (refer to Section 5, Set Up Mode).
17. Press the **ESC** button twice to return to the Normal Display Mode.
18. Press the battery reset button and the lower display will show "BATT INSTALL DATE" and the upper display should show the current date.
19. Press the **ESC** button to return to the Normal Display.
20. Check that the COR VOL displayed in the Normal Display Mode closely matches the LAST COR \* that was recorded earlier in this procedure. If the values are significantly different, remove the ECM2™ from service and return it to Romet for servicing.
21. Clean the gasket area if necessary.
22. Install new battery compartment lid gasket and tighten the (6) screws securely.
23. Install a new sealing wire, if required.
24. Since the lithium battery pack had expired, the COR and UNC VOL ceased being registered after the LAST DATE and LAST TIME. Refer to Section 8, Alarms, Low Battery Alarm to estimate and program the current COR and UNC VOL for the ECM2™.

**c) Temperature malfunction is displayed when replacing the battery pack**

18. Press the ↑↓ scroll buttons to locate the following menu items and record the values:
  - DATE (D/M/Y)
  - TIME (H/M/S)
  - BAT ALARM DATE
  - LAST COR \*
  - LAST UNC \*
  - LAST STORED DATE
  - LAST STORED TIME
  - UNC SINCE MALF
19. If the DATE and TIME are correct, continue to step 6. If the DATE and TIME are incorrect, continue to step 3. If the COR VOL showing on the Normal Display does not closely match the LAST COR \*, remove the ECM2™ from service and return to Romet.
20. Press the **ESC** button once to exit the FULL DISPLAY menu and press the ↑ scroll button once to move to the SET UP mode.
21. Press the **ENT** button and enter the password (refer to Section 4, Security) when prompted.
22. Press the ↑↓ scroll buttons to locate SET DATE and SET TIME. Enter the correct date and time (refer to Section 5, Set Up Mode).
23. Press the **ESC** button twice to return to the Normal Display Mode.
24. Press the battery reset button and the lower display will show "BATT INSTALL DATE" and the upper display should show the current date.
25. Allow the ECM2™ to operate until the COR VOL changes value. If the upper display remains on, continue to step 10. If the upper display turns off, press the **ESC** button and continue to step 9.
26. If the lower display shows "BATTERY MALF", remove the ECM2™ from service and replace the temperature sensor (refer Section 9, Temperature Sensor Replacement).
27. Clean the gasket area if necessary.
28. Install new battery compartment lid gasket and tighten the (6) screws securely.
29. Install a new sealing wire, if required.

### 13. PULSE OUTPUTS

The ECM2™ has three Form "A" outputs that can be configured at the factory to provide any combination of the following three outputs:

- UNC VOL
- COR VOL
- Alarm

The pulse weight for the volumetric outputs is configured in the Set Up Mode, under menu items: "SET UNC OUT" and "SET COR OUT". The pulse outputs are solid state, open collector and are optically isolated to protect the ECM2™ from electrical surges. The maximum current rating is

100mA at 5-30 VDC with a pulse width of 50 ms. Additional pulse width configurations are available to provide compatibility with various AMR products. Consult the factory for assistance.

Refer to the Appendix, ECM2™ Barrier Installation for the Pulse Connections to the ECM2™ and ECM2™ Pulse Output Connector Configurations.

### **13. INSTALLATION AND MAINTENANCE INSTRUCTIONS**

The ECM2™ has been ruggedly designed to deliver reliable service. Proper handling and installation will allow the ECM2™ to deliver full measurement performance. The mechanical installation and maintenance of the ECM2™ meter body is addressed in the following ROMET Bulletins:

- Installation and Maintenance of RM Imperial & Metric Meters,
- Installation and Maintenance of G Metric & RG Imperial Meters.

If the ECM2™ output pulse is being connected to an external device (AMR), the electrical specifications in Section 11, Pulse Outputs, should be addressed. Particular attention should be paid to the installation of barriers for intrinsic safety (refer to Barrier Installation for the Pulse Output Connections to the ECM2™ and ECM2™ Pulse Output Connector Configurations in the Appendix.

### **14. INSTALLATION OF AN ECM2™ MODULE TO A ROMET METER BODY**

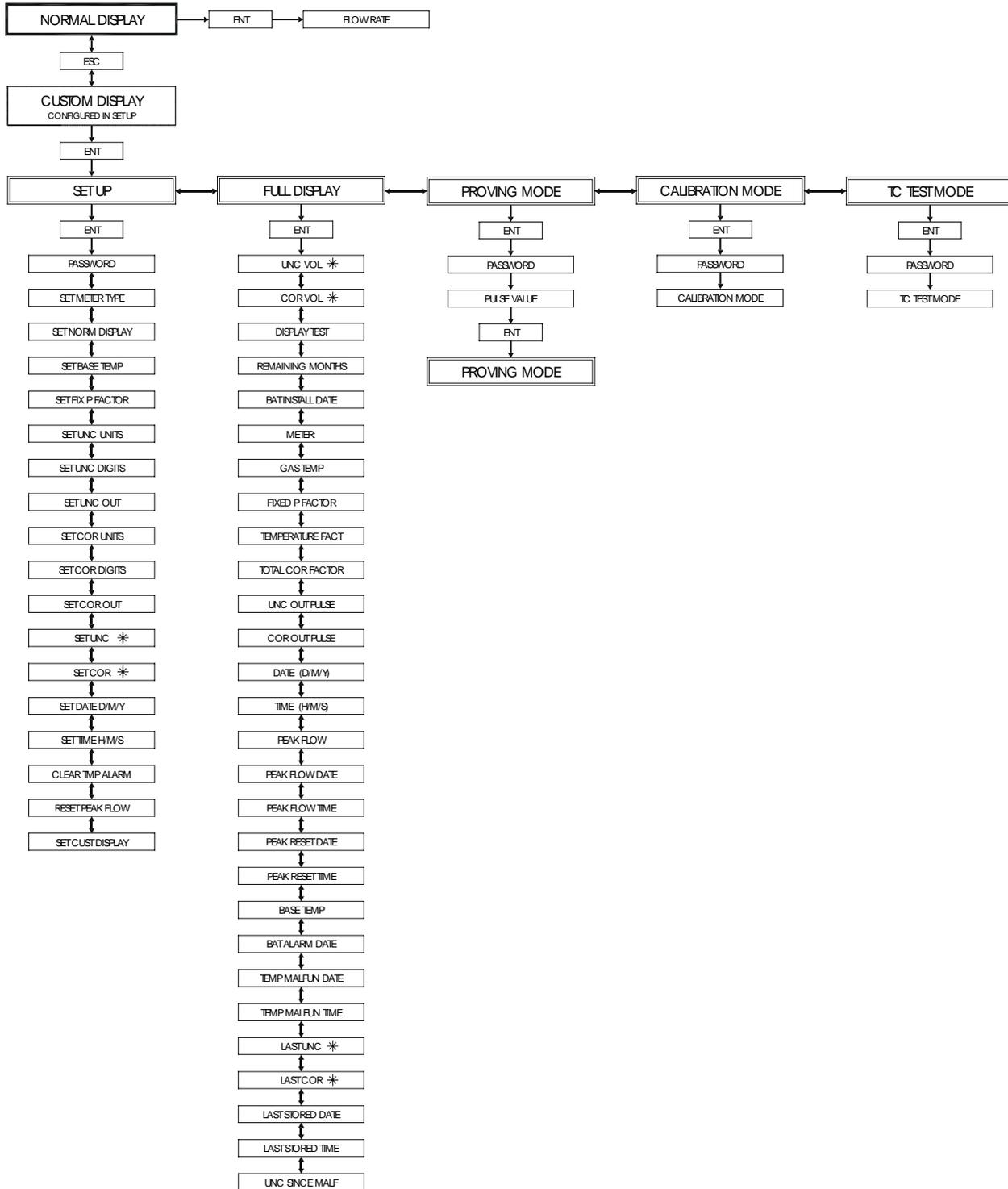
The ECM2™ can be installed on any Romet TC meter body that has been manufactured after 1994 (the first two digits of the Romet meter serial number signify the year of manufacture, as example S/N # 951234 was manufactured in 1995). In the case of a Romet meter body that pre-dates 1994, the magnetic housing would need to be upgraded to the current design. The magnetic housing can either be replaced with a new magnetic housing or returned to Romet for upgrading.

Each loose ECM2™ module is shipped with installation instructions and the required mounting hardware:

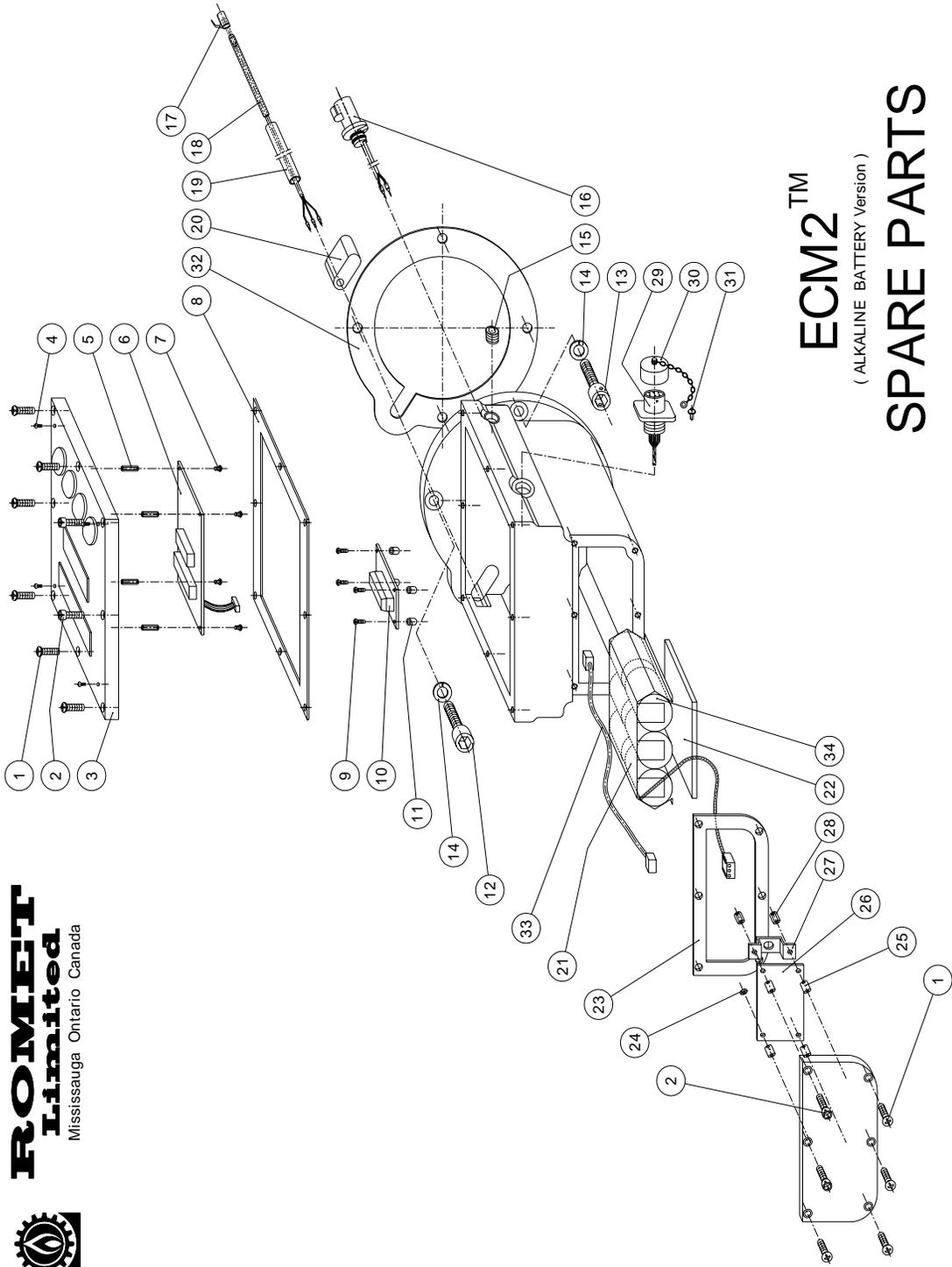
- Housing Gasket P/N 34-140-1
- Cap Screws (2 required) 1126 (Imperial) or 1319 (Metric)
- Seal Screws (2 required) 1-341-9 (Imperial) or 34-141-1 (Metric)
- Lock Washers (4 required)

**Note:** Do not substitute the above hardware with the existing mounting hardware from the old mechanical meter module. The cap screws are differ in length for the ECM2™.

# MODES OF OPERATION



# ECM2™ Module Parts List (Alkaline)



## ECM2™ (ALKALINE BATTERY Version) SPARE PARTS

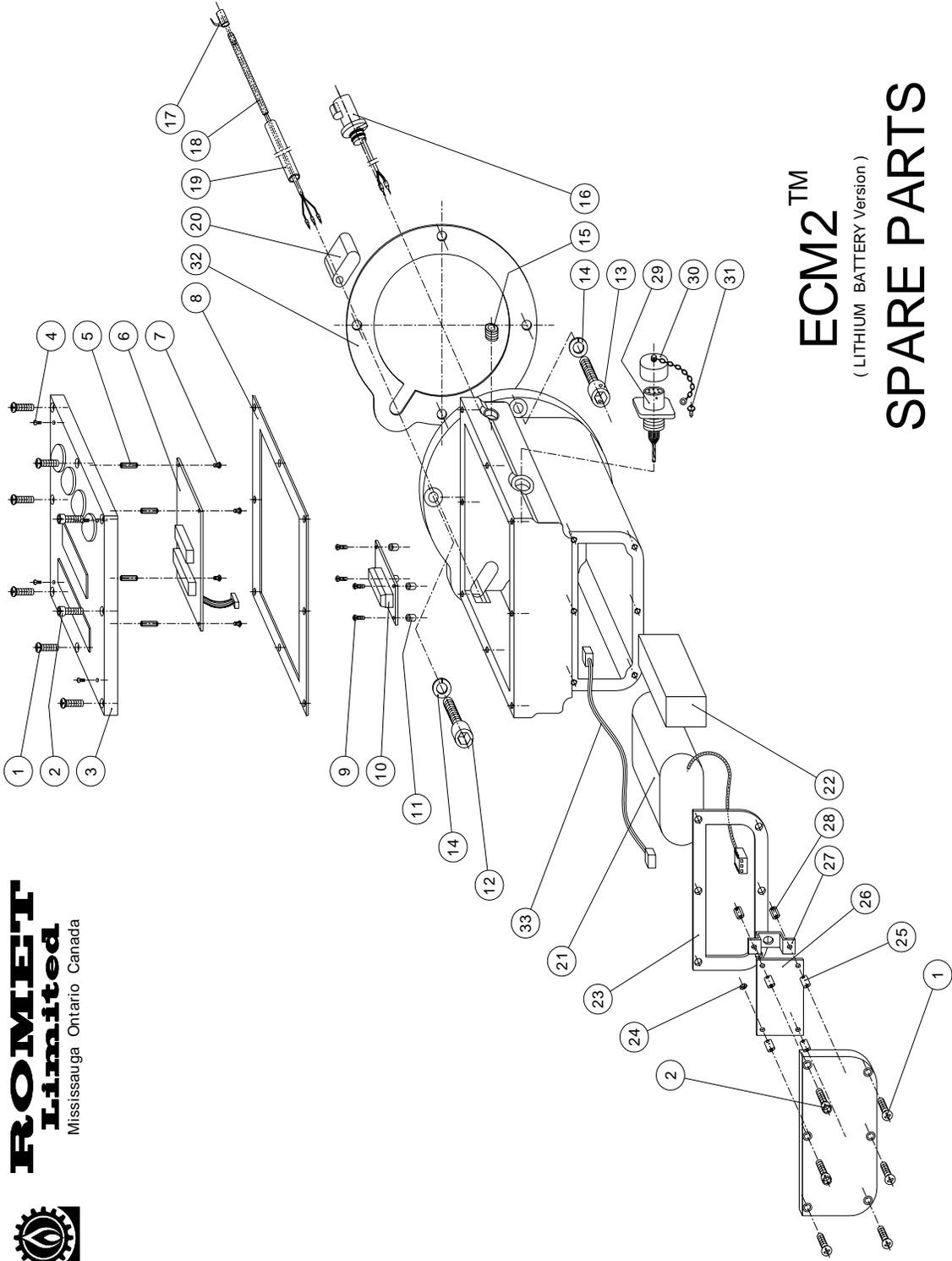
**ROMET**  
**Limited**  
Mississauga Ontario Canada



## ECM2™ PARTS LIST (Alkaline)

ITEM	PART NUMBER	DESCRIPTION
1	2119	OVAL HEAD SCREW
2	65-960-5	SEAL SCREW
3	34-134-10	LID ASSEMBLY
4	1159	DRIVE SCREW
5	2124	SPACER
6	34-061-20	MOTHER BOARD
7	2080	PHILLIPS SCREW
8	34-133-6	ELECTRONIC COMPARTMENT GASKET
9	2081	PHILLIPS SCREW
10	34-063-20B	INTERFACE BOARD
11	2103	SPACER
12	1319 1126	CAP SCREW - METRIC CAP SCREW - IMPERIAL
13	34-141-1 1-341-9	SEAL SCREW - METRIC SEAL SCREW - IMPERIAL
14	1092 A	LOCK WASHER
15	1115	PRESSURE PLUG
16	34-124-0	INPUT SENSOR
17	34-102-11	TEMPERATURE PROBE CLAMP
18	34-502-0	TEMPERATURE SENSOR & CABLE ASSEMBLY
19	0656	POLYETHYLENE PLASTIC TUBE
20	34-133-15	TEMPERATURE PROBE SUPPORT
21	34-092-41	ALKALINE BATTERY HOLDER ASSEMBLY
22	34-145-2	BATTERY CHAMBER FILLING
23	34-133-7	BATTERY COMPARTMENT GASKET
24	2079 A	NUT
25	34-515-5	SPACER
26	34-067-30C	SWITCH BOARD
27	34-135-2	SWITCH PROTECTOR
28	34-235-3	SEALING NUT
29	34-125-20 34-125-40 34-125-50	OUTPUT CONNECTOR ASSEMBLY - 5 PIN CANNON OUTPUT CONNECTOR ASSEMBLY - 6 PIN CANNON (standard) OUTPUT CONNECTOR ASSEMBLY - 6 PIN BRAD - HARRISON
30	6505 6194 6308	DUST CAP - 5 PIN CANNON DUST CAP - 6 PIN CANNON DUST CAP - 6 PIN BRAD - HARRISON
31	1157	DRIVE SCREW
32	34-140-1	HOUSING GASKET
33	34-064-3	SWITCH BOARD CABLE
34	34-092-40	1.5 V ALKALINE "C" SIZE CELL

# ECM2™ Module Parts List (Lithium)



## ECM2™ (LITHIUM BATTERY Version) SPARE PARTS

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Mississauga Ontario Canada



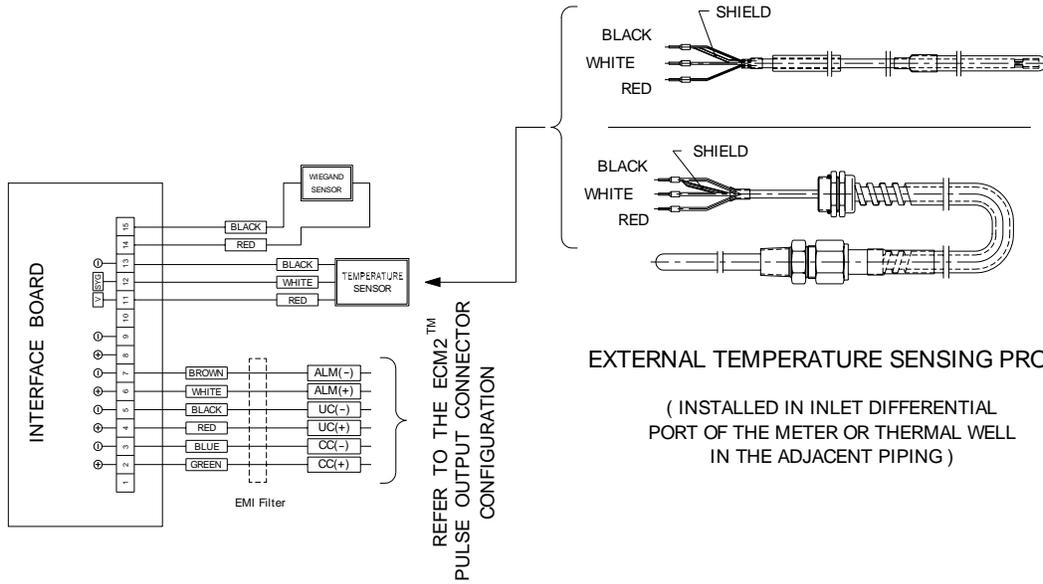
## ECM2™ PARTS LIST (Lithium)

ITEM	PART NUMBER	DESCRIPTION
1	2119	OVAL HEAD SCREW
2	65-960-5	SEAL SCREW
3	34-134-10	LID ASSEMBLY
4	1159	DRIVE SCREW
5	2124	SPACER
6	34-061-20	MOTHER BOARD
7	2080	PHILLIPS SCREW
8	34-133-6	ELECTRONIC COMPARTMENT GASKET
9	2081	PHILLIPS SCREW
10	34-063-20B	INTERFACE BOARD
11	2103	SPACER
12	1319 1126	CAP SCREW - METRIC CAP SCREW - IMPERIAL
13	34-141-1 1-341-9	SEAL SCREW - METRIC SEAL SCREW - IMPERIAL
14	1092 A	LOCK WASHER
15	1115	PRESSURE PLUG
16	34-124-0	INPUT SENSOR
17	34-102-11	TEMPERATURE PROBE CLAMP
18	34-502-0	TEMPERATURE SENSOR & CABLE ASSEMBLY
19	0656	POLYETHYLENE PLASTIC TUBE
20	34-133-15	TEMPERATURE ROBE SUPPORT
21	34-092-10	LITHIUM BATTERY PACK
22	34-145-1	BATTERY SUPPORT
23	34-133-7	BATTERY COMPARTMENT GASKET
24	2079A	NUT
25	2-515-5	SPACER
26	34-064-20A	SWITCH BOARD
27	34-135-21	SWITCH PROTECTOR
28	34-235-3	SEALING NUT
29	34-125-20 34-125-40 34-125-50	OUTPUT CONNECTOR ASSEMBLY - 5 PIN CANNON OUTPUT CONNECTOR ASSEMBLY - 6 PIN CANNON (standard) OUTPUT CONNECTOR ASSEMBLY - 6 PIN BRAD - HARRISON
30	6505 6194 6308	DUST CAP - 5 PIN CANNON DUST CAP - 6 PIN CANNON DUST CAP - 6 PIN BRAD - HARRISON
31	1157	DRIVE SCREW
32	34-140-1	HOUSING GASKET
33	34-064-3	SWITCH BOARD CABLE

# ECM2™ INTERFACE BOARD CONNECTIONS

## EXTERNAL TEMPERATURE SENSING PROBE

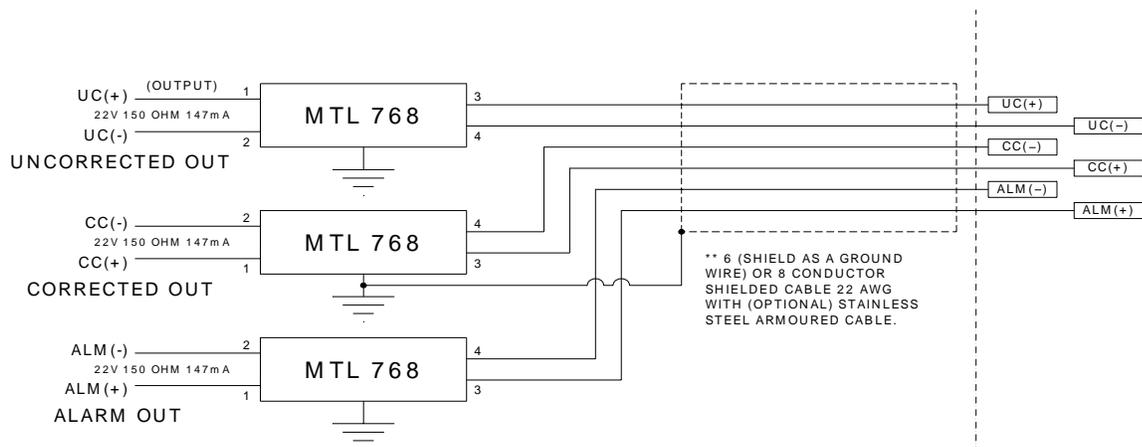
( INSTALLED IN THE TC WELL OF THE METER )



## EXTERNAL TEMPERATURE SENSING PROBE

( INSTALLED IN INLET DIFFERENTIAL PORT OF THE METER OR THERMAL WELL IN THE ADJACENT PIPING )

# BARRIER INSTALLATION FOR PULSE CONNECTIONS TO ECM2™



SAFE AREA

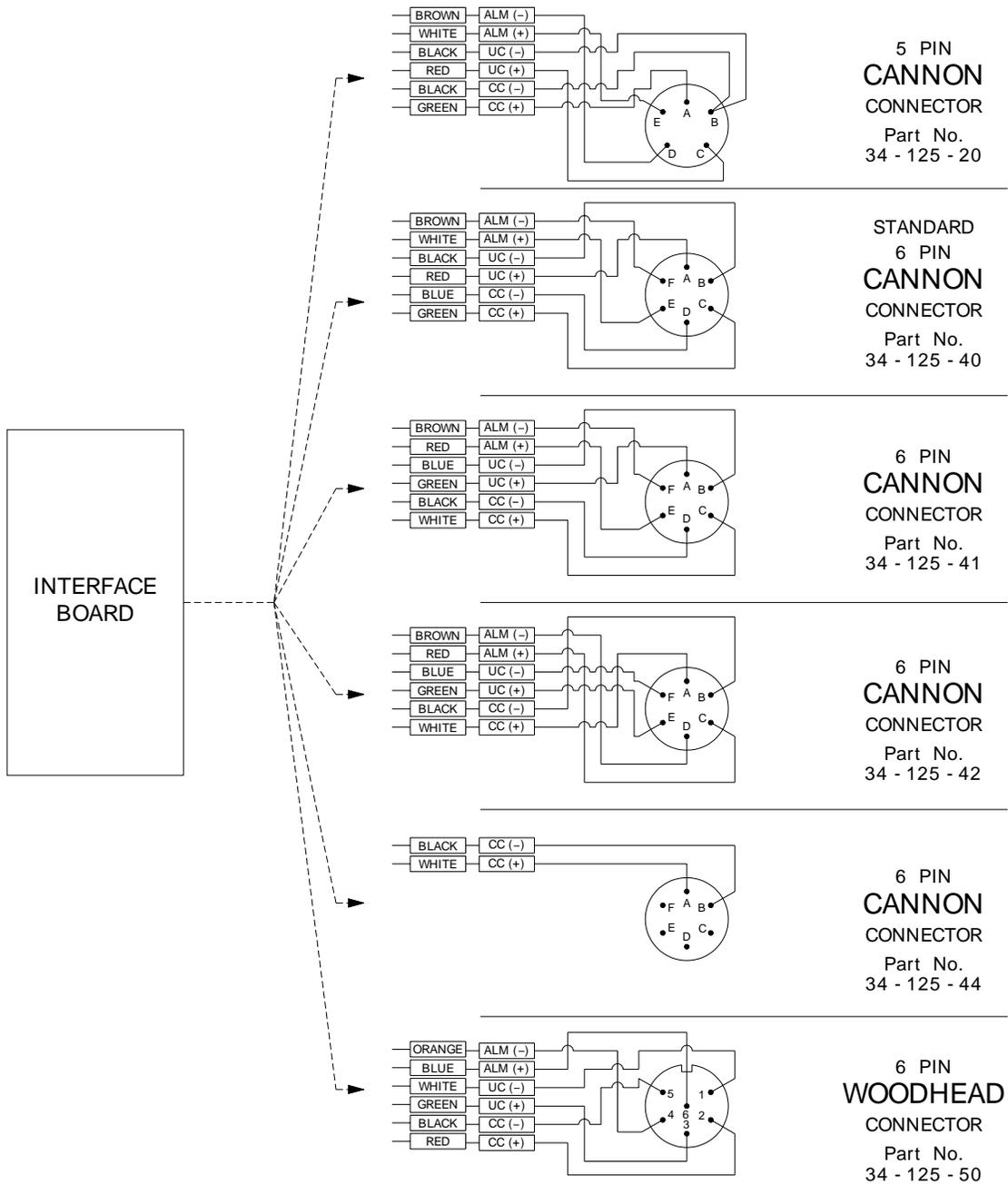
HAZARDOUS AREA

Class I  
Group D

### NOTES:

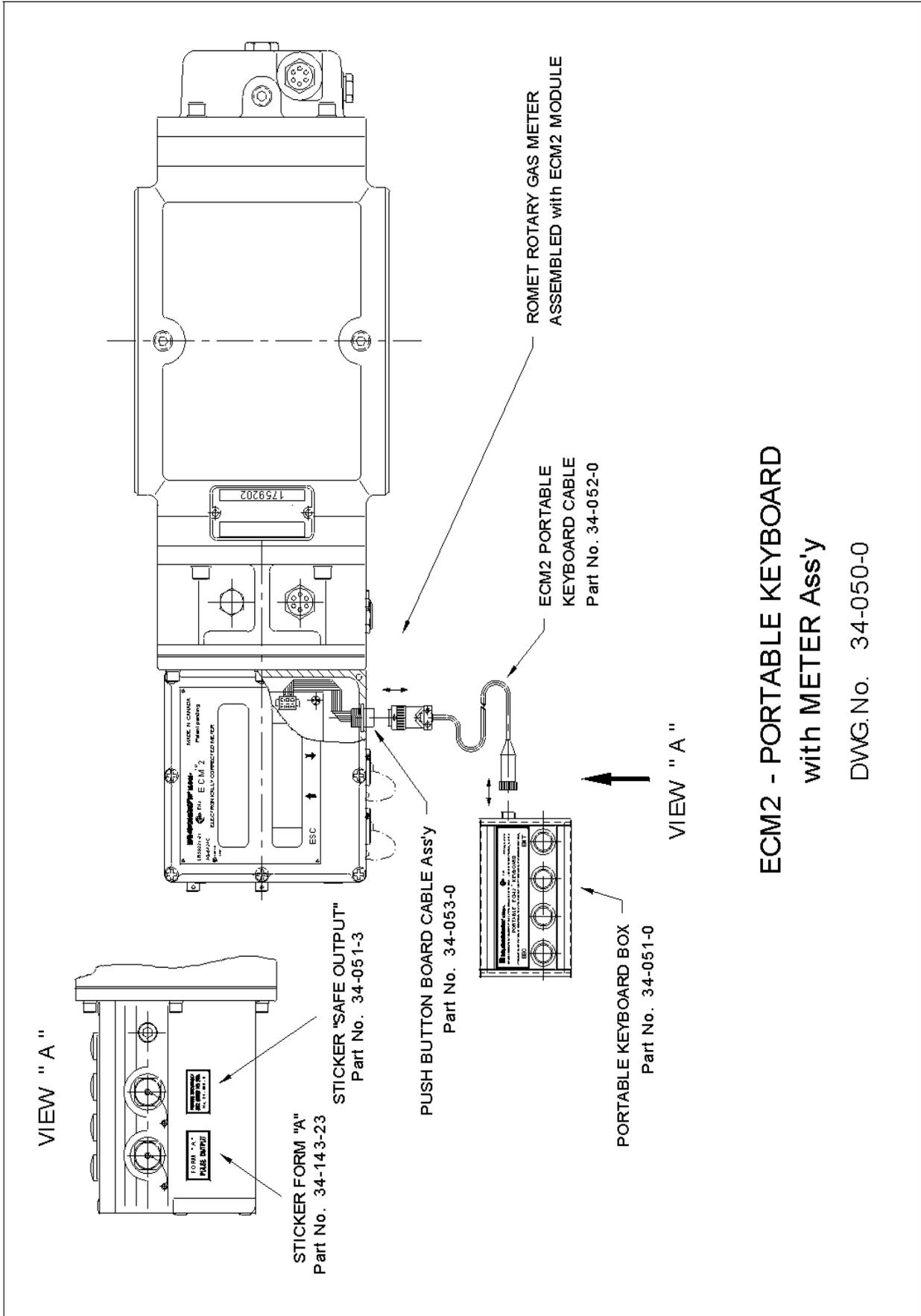
1. ALL BARRIERS MUST BE INSTALLED AS PER MANUFACTURES SPECIFICATION.
2. MTL BARRIERS ARE MANUFACTURED BY MEASUREMENT TECHNOLOGY LTD. IN ENGLAND.
3. ANY OTHER BARRIERS USED AS REPLACEMENT MUST BE CSA APPROVED.
4. \*\* CABLE USED MUST BE CSA AND UL APPROVED.
5. ALL EXTERNAL CONNECTIONS MUST COMPLY WITH THE CANADIAN ELECTRICAL CODE OR THE LOCAL STANDARD AS PER THE GOVERNING JURISDICTION.

# ECM2™ PULSE OUTPUT CONNECTOR CONFIGURATIONS



**ECM2 REMOTE KEYBOARD OPTION**





VIEW " A "

STICKER FORM "A"  
Part No. 34-143-23

STICKER "SAFE OUTPUT"  
Part No. 34-051-3

PUSH BUTTON BOARD CABLE Ass'y  
Part No. 34-053-0

ROMET ROTARY GAS METER  
ASSEMBLED with ECM2 MODULE

ECM2 PORTABLE  
KEYBOARD CABLE  
Part No. 34-052-0

PORTABLE KEYBOARD BOX  
Part No. 34-051-0

VIEW " A "

**ECM2 - PORTABLE KEYBOARD  
with METER Ass'y**

DWG No. 34-050-0



**SKID MOUNTED METER STATION WITH AN ECM2™ METER**