

Installation & Operating Instructions

Maverick IP Sub Metering Appliance

Model IP-SM-101



CE

FC

RoHS

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Username: *admin*

Password: *password*

SECTION 1 - Conformance & Testing

1.0.0 FCC Testing -

- Rule Part 15, Subpart B - Unintentional Radiators Class B Limits 15.107 & 15.109.

1.0.1 EMC/EMI Testing -

- BS EN 55022:1998, CISPR 22:1997 Amendments 1 & 2.
- BS EN 55024:1998, CISPR 24:1997 Amendments 1 & 2.
- EN 61000-3-3: Limitations of voltage fluctuations and flicker in low-voltage supply systems <16A.
- EN 61000-4-2: Electrostatic Discharge (ESD).
- EN 61000-4-3: Radiated, radio frequency, Electromagnetic field immunity test.
- EN 61000-4-4: Electrical Fast Transient/burst immunity test (EFT).
- EN 61000-4-5: Surge Immunity Test (Mains).
- EN 61000-4-6: Immunity to conducted disturbances induced by radio frequency fields.
- EN 61000-4-11: Voltage dips, short interruptions and voltage variations immunity test.

1.0.2 RoHS Compliant -

MAMAC Systems, Inc., products designated “RoHS Compliant” comply with the European Union’s Directive on the Restriction of the Use of Hazardous Substances 2002/95/EC (RoHS). These products do not contain Joint Industry Guide (JIG) - 101 Level A substances above threshold limits, except lead in RoHS exempt applications 5, 7a and 7c. These products do not contain perfluorooctane sulfonates (PFOS).

- **Cadmium (Cd)** < 100 ppm
- **Mercury (Hg)** < 100 ppm
- **Lead (Pb)** < 1000 ppm
- **Polybrominated Biphenyls (PBB)** < 1000 ppm
- **Polybrominated Diphenyl Ethers (PBDE)** < 1000 ppm
- **Hexavalent Chromium (CrVI)** < 1000 ppm

SECTION 1 - Specifications

1.1.0 All you need is a web browser running on any laptop, PDA, or cell phone anywhere in the world to monitor and log electric, gas, water or compressed air consumption. Receive email alerts if consumption crosses a threshold.

The *Maverick* IP Sub Metering Appliance incorporates a web server, accepts a pulse input from any energy meter (KWH, water, gas, steam or compressed air) and displays consumption by the minute, hour, day, week and month. The appliance logs the data in CSV format, and usage can be viewed as bar graphs for the minute, hour, day, week and month. The appliance can also email periodic consumption reports every hour, day, week or month which can be imported into Excel, Word or any other application which accepts CSV data. Data is also available formatted for XML and any application can retrieve the data for storage or analysis.

Power the appliance with any 24VAC transformer, plug it into a hub/router, launch any web browser, punch in the default IP and connect. No custom software to load, no discovery routines, no custom cables or training. The Sub Metering *Maverick* serves up static web pages with dynamic energy consumption data updates every second or two. Most users can configure and utilize the appliance without any training or support in less than five minutes.

For effective utilization of energy and natural resources, waste and inefficiency have to be eliminated. This can only be accomplished by holding energy consumers accountable. The *Maverick* IP Sub Metering Appliance provides an ideal low cost solution for consumption data acquisition and analysis.

SPECIFICATIONS:

Supply Voltage: 24 VAC/VDC

Supply Current: 250 mA (6 VA)

Ethernet: 10-Base T

IP Assignment: Static or DHCP

Email: SMTP to two email addresses

Meter Pulse Input: Dry contact closure (1.0 mA load)

Environmental: 10-90%RH Non-Condensing

Operating Temp: -40°F to 125°F (-40°C to 52°C)

Storage Temp: -40°F to 150°F (-40°C to 66°C)

Termination: Removable terminal blocks
16 Ga max., RJ-45 Ethernet jack

Data Logging CSV Files:

Minute 1440 samples

Hour 744 samples

Day 366 samples

Week 53 samples

Month 12 samples

Data Logging Graphs:

Minute 60 samples

Hour 24 samples

Day 31 samples

Week 8 samples

Month 12 samples

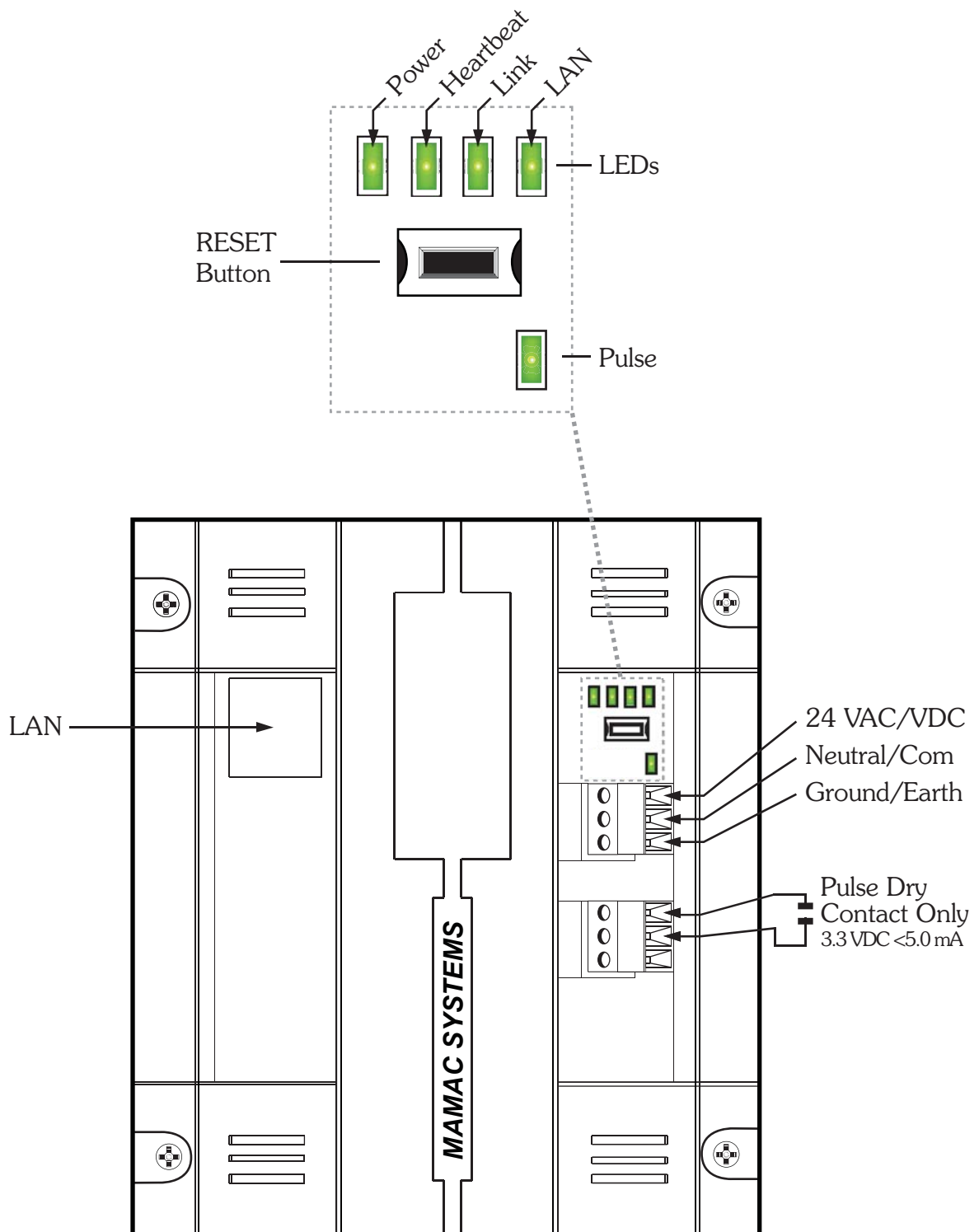
Enclosure: UL 94V-5-O Polycarbonate plastic

Weight: 0.5 lbs. (.25 kg)

SECTION 1 - Appliance Overview

1.2.0

Figure 1



SECTION 1 - Installation

1.3.0 INSPECTION:

Inspect the package for damage. If damaged, notify the appropriate carrier immediately.

1.3.1 REQUIREMENTS:

- Tools (not provided)
 - Digital Volt-ohm Meter (DVM).
 - Appropriate screwdriver for mounting screws.
 - Appropriate drill and drill bit for mounting screws.
- Four #6 sheet metal screws.
- Training: Installer must be a qualified, experienced technician.

Warning:

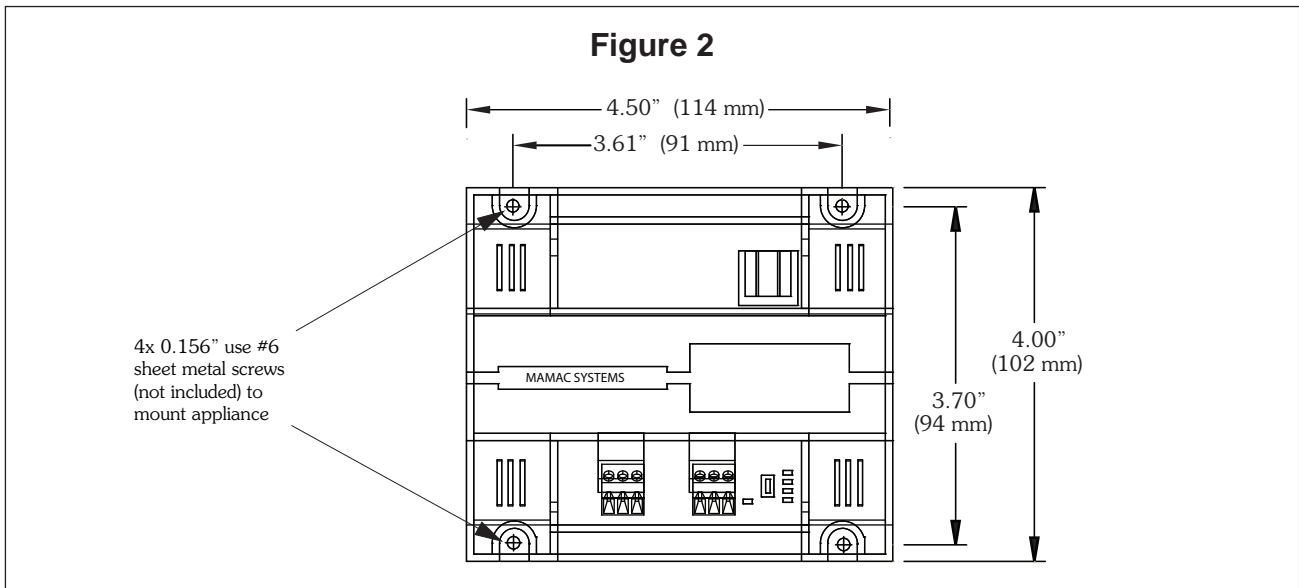
- Disconnect power supply before installation to prevent electrical shock and equipment damage.
- Make all connections in accordance with national and local electrical codes. Use copper conductors only.

Caution:

- Use electrostatic discharge precautions (e.g., use of wrist straps) during installation and wiring to prevent equipment damage.
- Avoid locations where severe shock or vibration, excessive moisture or corrosive fumes are present.
- Do not exceed ratings of the device.

1.3.2 MOUNTING:

The Maverick IP Sub Metering Appliance must be mounted on a flat surface with four #6 sheet metal screws (not provided) as shown in Figure 2.



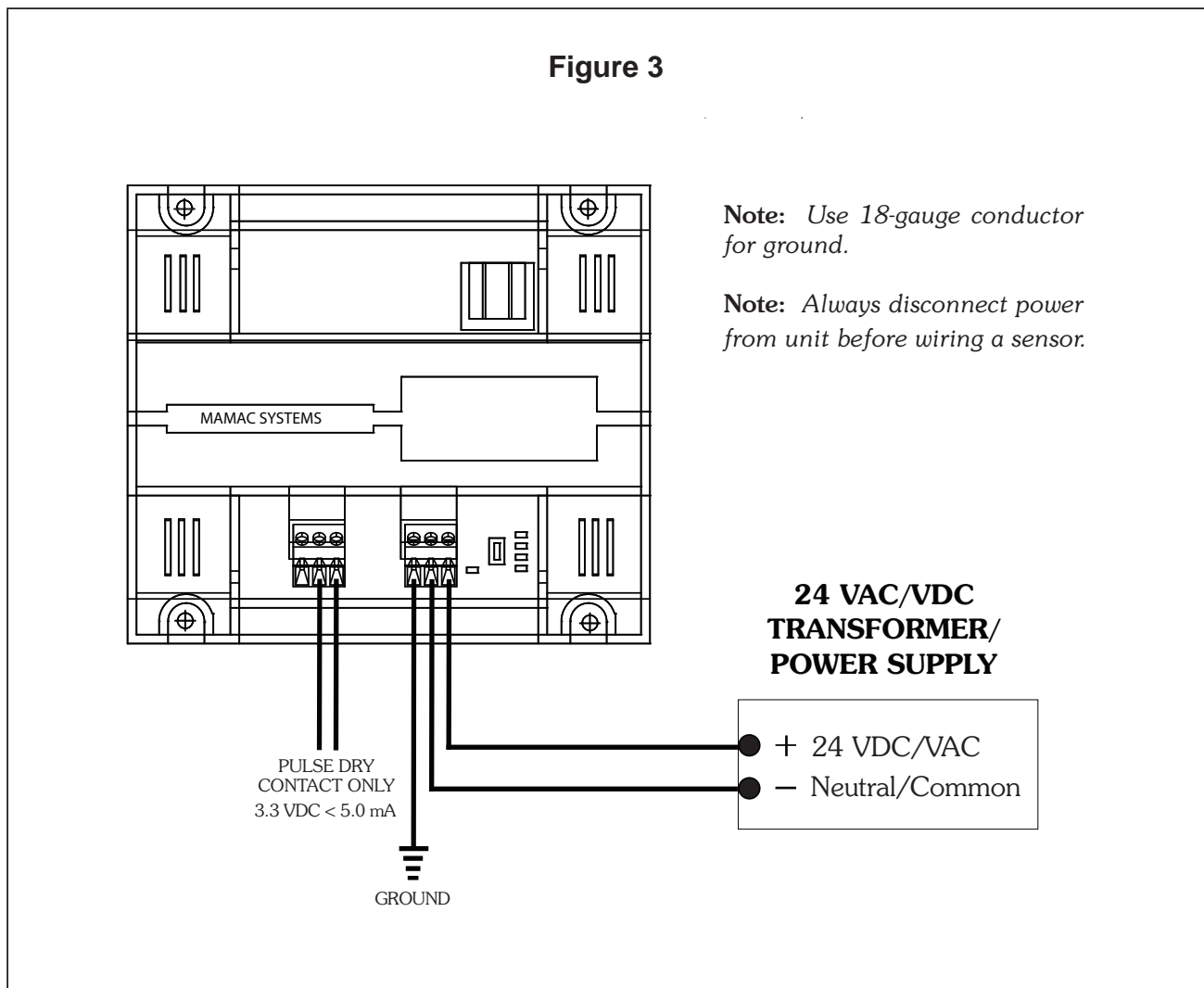
SECTION 1 - Wiring

1.4.0 Terminate the IP Sub Metering Appliance as shown in Figure 3.

1.4.1 Use a UL rated 24VAC Class-2 transformer or a UL rated 24VDC power supply with transformer isolation.

⚠ WARNING: Maximum supply voltage **MUST NOT EXCEED 35VAC/35VDC.**

1.4.2



SECTION 2 - Initial Configuration

2.0.0 For first time start-up, a laptop/PC and a crossover cable is required. If a crossover cable is not available, a hub can also be used as shown in Figure 4B. Terminate the appliance as shown in Figure 3. Unplug the input and output terminal blocks and leave only the power terminal block plugged in. Attach the crossover cable to the appliance and the other end to the laptop ethernet jack as shown in Figure 4A. If using a hub, attach a CAT 5 patchcord between the appliance and the hub and another CAT 5 patchcord between the hub and laptop as shown in Figure 4B.

Turn the power on. The *Power* LED will come on. After 10 seconds the *Heartbeat* LED will start blinking at one pulse per second rate. The *Link* LED should light up if the appliance is correctly connected to the laptop/PC.

Figures 4A and 4B

Figure 4A

Configuration 1

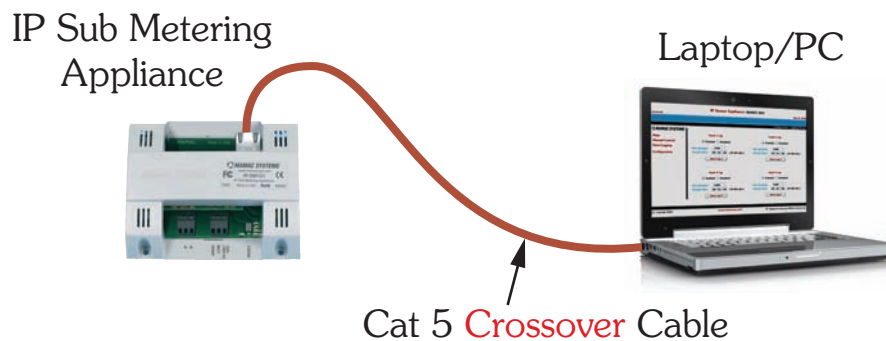
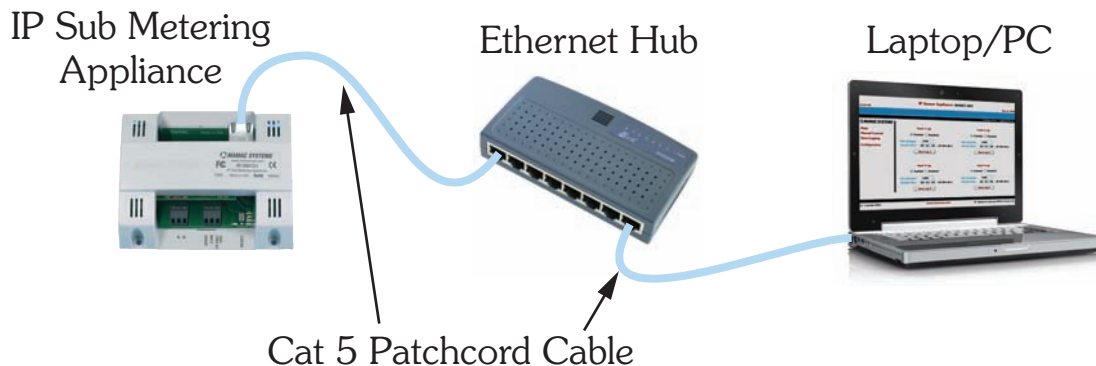


Figure 4B

Configuration 2

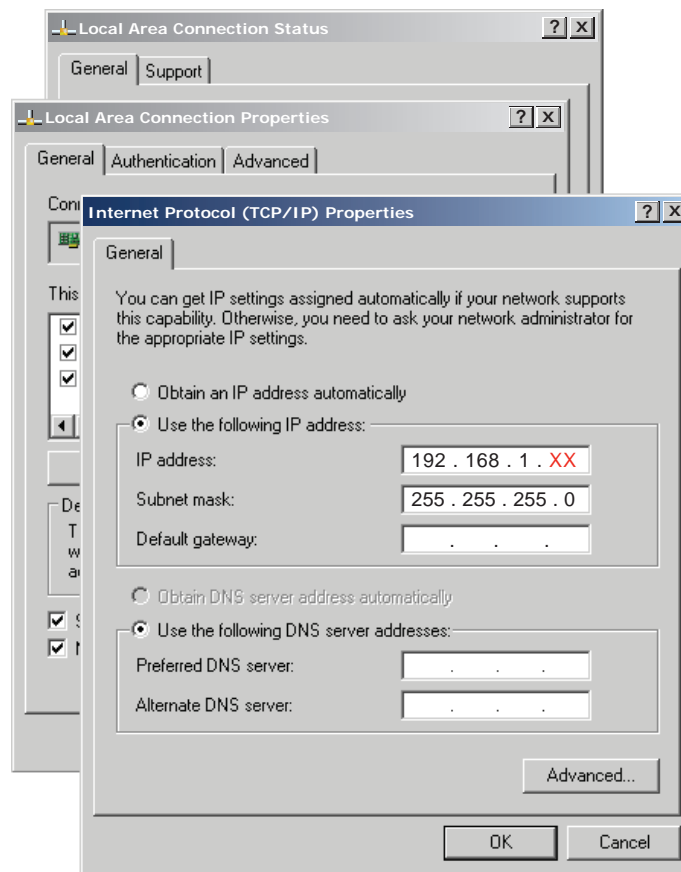


SECTION 2 - Internet Protocol

2.1.0 Insure that the laptop/PC network settings are set up correctly. From the **Start** menu, go to **Settings**, click **Network Connections**. Double-click the **Local Area Connection** icon. Local Area Connection Status screen will open. Click on the **Properties** tab. Local Area Connection Properties page will open. Scroll down to **Internet Protocol (TCP/IP)** and click/highlight. Now click on the **Properties** tab on the same screen. Internet Protocol (TCP/IP) Properties page will open. Click the **Use the following IP address:** radio button. Now punch in a static IP address with the same subnet as the appliance as shown in Figure 5. Example: 192.168.1.XX. The XX can be any number except 10 because the Maverick default IP is 192.168.1.10. We recommend using 192.168.1.11. Now click on the second line **Subnet mask**. It should automatically fill in with 255.255.255.0. If it does not, please input the subnet as shown below. Default Gateway and DNS setup is not required for initial setup. Fields can be left blank. Click **OK**. Now **OK** or **Close** out of the **Network Connections**.

If Windows wants to restart the laptop/PC after the network configuration, please do so. Laptop/PC is configured to do initial configuration of the appliance. Launch the Internet Explorer or Firefox web browser. Delete everything in the address box and punch in the default IP 192.168.1.10. Press enter. The Maverick will connect, and the **Password/Clock** page will be served up by the appliance to force the user to change the password.

Figure 5



SECTION 2 - Password/Clock Configuration

- 2.2.0** When connecting to the IP Sub Metering Appliance the first time, the Password/Clock page will be served up by the Maverick to force the user to change the default password and username. Current time, date, firmware version and MAC address is displayed on the Password/Clock page for reference purposes.
- 2.2.1 Node I.D.:** Please fill in the name of the appliance in this field. Maximum 20 alpha and/or numeric characters (uppercase or lowercase).
- 2.2.2 Main Page Refresh Rate:** The Maverick appliance uses AJAX and XML to automatically refresh the Main page. The default refresh rate is **1.0 second**. If the user desires to slow down the refresh rate, click on the down arrow and pick the desired refresh rate.
- 2.2.3 Username:** Default username is **admin** (Lowercase). Please enter a username up to 20 alpha and/or numeric characters. **Caution: Username field is case sensitive.**
- 2.2.4 Password:** The default password is **password** (Lowercase). Please enter a new password up to 24 alpha and/or numeric characters. **Caution: Password field is case sensitive.**
- 2.2.5 Time & Date:** The current time and date is displayed on the top of the page. Update time, date and day as needed.

Click **Save**. All fields will update on the page.

The screenshot displays the configuration interface for the IP Sub Metering Appliance (UNO Meter). The page title is "IP Sub Metering Appliance: UNO Meter" and the current time is 11:38:02 on Friday, May 1, 2009. The navigation menu includes "Main", "Data Logging", and "Configuration". The "GENERAL" section contains the following information:

- Current Time & Date: 11:38:02, Friday, May 1, 2009
- Firmware Version: 1.01
- MAC Address: 00-50-C2-A1-E0-10
- Node I.D.: UNO Meter
- Main Page Refresh Rate: 1 Sec

The "LOGIN" section includes input fields for Username, Password, and Re-Enter Password. The "TIME & DATE" section includes a Time field (13:38:02), a Date field (May 1, 2009), and radio buttons for selecting the Day (Sun, Mon, Tues, Wed, Thur, Fri, Sat). A "Save" button is located at the bottom right of the configuration area.

SECTION 2 - Network & Email Configuration

2.3.0 Static IP Network Configuration

The Maverick appliance can be configured with a Static IP or DHCP. From the Main page select **Configuration** and highlight **Network/Email**, and the appliance will serve up a new page. The default configuration is **Static IP** (DHCP disabled). Fill in the **Device IP Address**, **Subnet Mask**, **Default Gateway** and **DNS Server** in the appropriate fields. The Static IP set up is exactly the same as any laptop/PC network configuration.

Enter up to two email addresses in the appropriate fields for the Maverick email alerts. Since the Maverick sends a SMTP email directly without an ISP account, the **Email From** field must have a valid email address, or some email servers/ISP may reject the email. For the **Email Server** based on preference click the **DNS** or **SMTP IP** button. In most cases if not all, DNS (default) is used, and a DNS (Domain Name System) server is available on the network to resolve the host name to an IP address. If a power cycle email is desired, click the **Enabled** button. For static IP configuration, leave the **DHCP IP Change Email Disabled** (default). Click **Save**.

(Default **Email From**: `appliance@mamacsys.com`.)

2.4.0 DHCP Network Configuration

Dynamic Host Communication Protocol is used if a static IP is not available. To configure the appliance as DHCP click the **DHCP Enabled** radio button. Please insure that at least *one* valid email is set up in the **Email #1** or **Email #2** field. Click **DHCP IP Change Email** radio button to **Enabled**. The email section is configured the same as above. Click **Save**. **WARNING: In DHCP configuration insure that there is a valid email address in one of the fields and DHCP IP Change Email is Enabled.** This is required for the Maverick to send an email and inform the user of its DHCP server-assigned IP address.

The screenshot shows the configuration page for the IP Sub Metering Appliance: UNO Meter. The page is titled "IP Sub Metering Appliance: UNO Meter" and shows the date "May 1, 2009" and time "13:22:52". The navigation menu includes "Main", "Data Logging", and "Configuration". The "Configuration" section is active, showing two tabs: "NETWORK" and "EMAIL".

NETWORK Configuration:

- DHCP: Enabled Disabled
- Device IP Address: 192 | 168 | 1 | 10
- Subnet Mask: 255 | 255 | 255 | 0
- Gateway IP Address: 192 | 168 | 1 | 200
- DNS Server IP Address: 192 | 168 | 1 | 200

EMAIL Configuration:

- Email #1: [Empty field]
- Email #2: [Empty field]
- Email From: `appliance@mamacsys.com`
- Email Server: DNS SMTP IP
- SMTP Server IP: 0 | 0 | 0 | 0
- DHCP IP Change Email: Enabled Disabled
- Power Recycle Email: Enabled Disabled

Buttons: **Save**, **Send Test Email**

Footer: © Copyright 2009, www.mamacsys.com, Registered trademark MAMAC Systems, Inc.

SECTION 2 - Meter Configuration

2.5.0 Caution: Before starting the IP Sub Metering Appliance, please insure that the time and date are configured to maintain data integrity.

2.5.1 Note: Disconnect the pulse input terminal block.

2.5.2 Reset Meter: Click the **Reset Meter** button to reset all data fields to zero.

2.5.3 Constant: Input the meter constant. The meter constant is the value per pulse. For example, if each pulse is equal to 100 Watts and the unit of measure is KWH, the meter constant will be 0.100. Similarly, if the water meter gives a pulse each gallon of flow per minute and the units are GPM, the meter constant will be 1.000. Meter constant can be from 0.001 to a maximum of 9.999.

2.5.4 Units: Enter units of measure. *Example: KWH, GPM, LPM, CFM, BTUH, MWH, etc.* Maximum 5 alpha and/or numeric characters (uppercase and/or lowercase).

2.5.5 Save: Click to save.

2.5.6 Note: Re-connect the pulse input terminal block. The IP Sub Metering Appliance is now ready to log data.

The screenshot displays the web interface for the IP Sub Metering Appliance. At the top, it reads "IP Sub Metering Appliance: UNO Meter" with a timestamp of "12:57:39" on the left and "May 1, 2009" on the right. Below this is a blue header bar with "Configuration | Meter" on the right. A sidebar on the left features the "MAMAC SYSTEMS" logo and a menu with "Main", "Data Logging", and "Configuration" (the latter being highlighted). The main content area is titled "METER CONFIGURATION" and contains two input fields: "Constant:" with the value "1.000" and "Units:" with the value "KWH". Below these fields are two buttons: "Save" and "Reset Meter". The footer of the page includes "© Copyright 2009", the website "www.mamacsys.com", and "Registered trademark MAMAC Systems, Inc."

SECTION 2 - Email Alerts & Periodic Email Reports

2.6.0 From the navigation bar, click to highlight **Configuration** and select **Email Alerts/Reports**. The appliance will serve up a new page to configure minute, hourly, daily, weekly or monthly email alerts and periodic email reports.

Click on the desired email alert/periodic report. A new page will open for the specific time period. If an email alert is desired, click on the **Alert Enable** radio button. Enter the value in the **Alert Value** field. The value can be 1 to 155575069890.

The appliance also logs consumption by the minute, hour, day, week and month in a CSV file. By clicking on the **Attach Log** radio button, the appliance will attach the log with the email alert.

2.6.1 If a periodic email report is desired, click the down arrow in the **Email Report Interval** field and select the appropriate report interval. The appliance will send an email at the end of each configured period and attach a CSV log file for the consumption during that time period. Multiple email alerts and periodic reports can be configured on the appliance.

The screenshot shows the web interface for an IP Sub Metering Appliance. The page title is "IP Sub Metering Appliance: UNO Meter". The time is 13:35:52 and the date is May 1, 2009. The navigation bar includes "Configuration", "Email Alerts/Reports", and "Minute". The main content area is titled "MINUTE EMAIL ALERTS & EMAIL REPORTS". It contains the "Email Minute Usage Alert Configuration" section with the following fields:

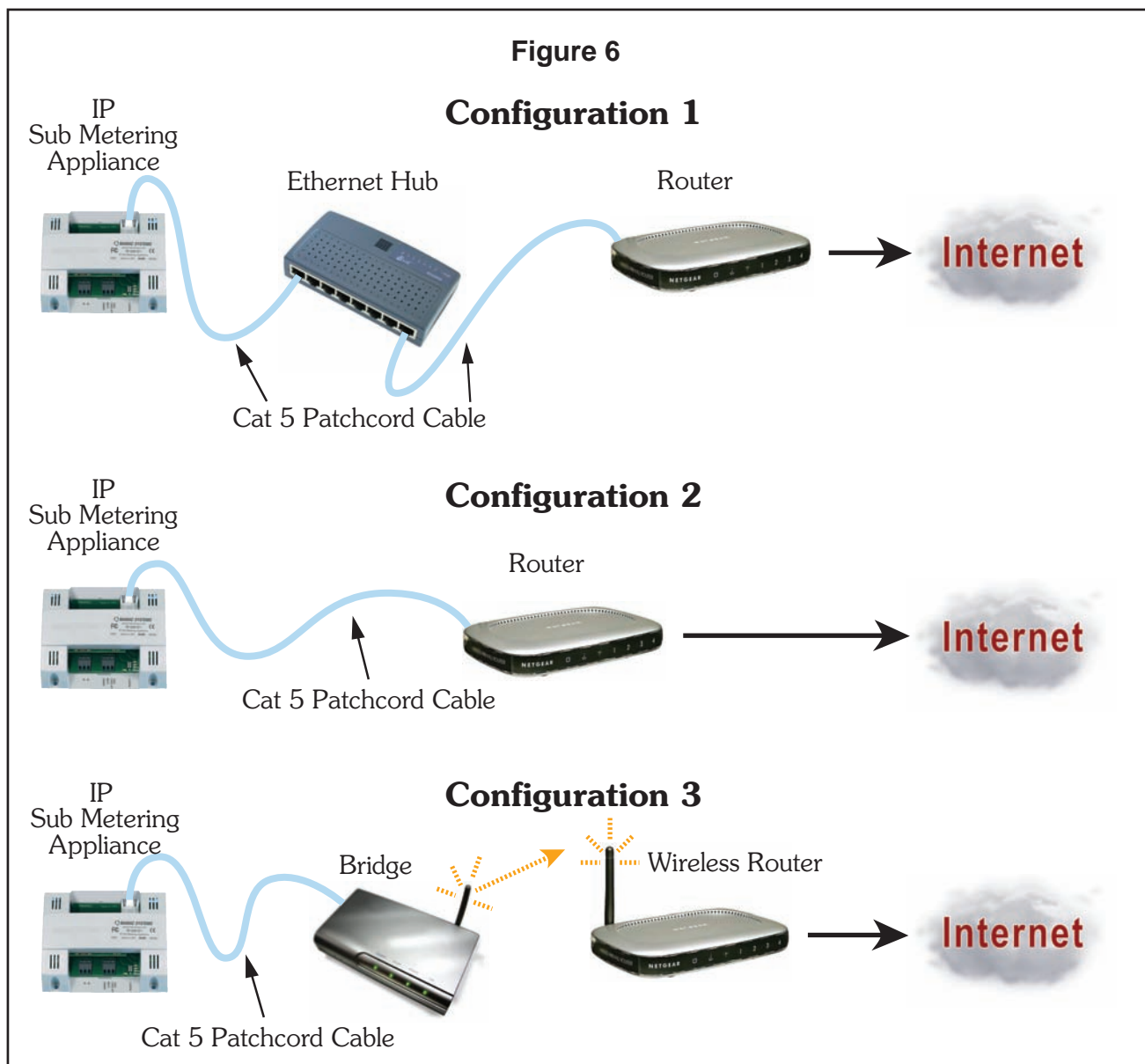
- Alert Enable:** Radio buttons for "On" (selected) and "Off".
- Alert Value:** A text input field containing the value "100".
- Attach Log:** Radio buttons for "On" (selected) and "Off".

Below this is the "Email Report Interval" section with a dropdown menu set to "Daily" and a "Save" button. The footer includes the MAMAC SYSTEMS logo, copyright information for 2009, and the website URL www.mamacsys.com.

SECTION 3 - Network Configuration Options

3.0.0 Static IP Address: After the initial configuration, power down the appliance by unplugging the power terminal block and disconnect the crossover cable. **CAUTION: Each time the static IP is changed, power cycle the appliance to load up the new static IP.** Connect the Maverick to the ethernet as shown in Figure 6. Three options are available -- 1) Use a CAT 5 patchcord and plug it into a hub or switch and connect the hub/switch to a router on the web. 2) Use a CAT 5 cable to connect directly to the router. 3) Configure an Ethernet Bridge and router and connect the appliance to the Bridge with a CAT 5 cable. For more information on wireless 802.11 B/G configuration, please refer to AN IP802.11.

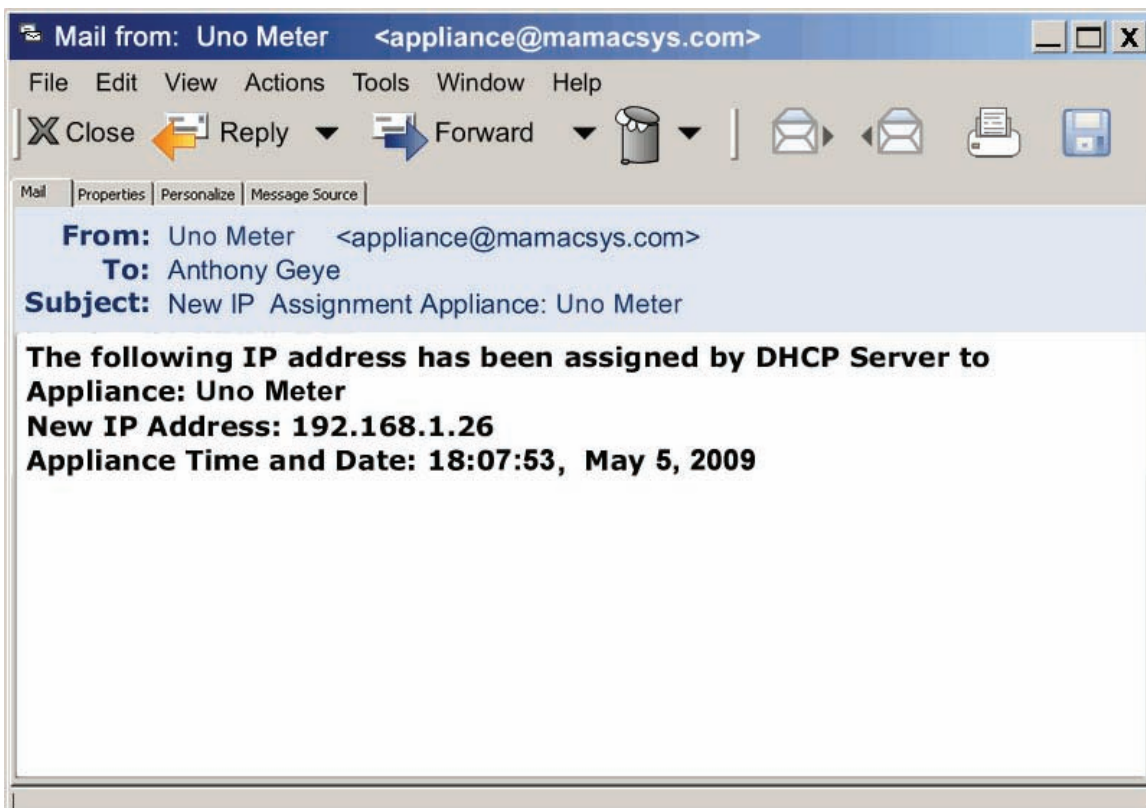
Connect the pulse input as shown in Figure 3 (Section 1.4.2). Power up the appliance. To connect to the appliance, launch a web browser (Internet Explorer or Firefox) on a laptop/PC, PDA or web-enabled mobile/cell phone. Delete all text in the browser address bar and punch in the static IP address and hit enter. The Maverick will connect and the Main page will launch. Have fun!



SECTION 3 - Network Configuration Options

3.0.1 DHCP IP Assignment: If during initial configuration *DHCP* was enabled, power down the appliance and disconnect the crossover cable. Connect the Maverick to the ethernet as shown in Figure 6. Three options are available -- 1) Use a CAT 5 patchcord and plug it into a hub or switch and connect the hub/switch to a router on the web. 2) Use a CAT 5 cable to connect directly to the router. 3) Configure an Ethernet Bridge and router and connect the appliance to the Bridge with a CAT 5 cable. For more information on wireless 802.11 B/G configuration, please refer to AN IP802.11.

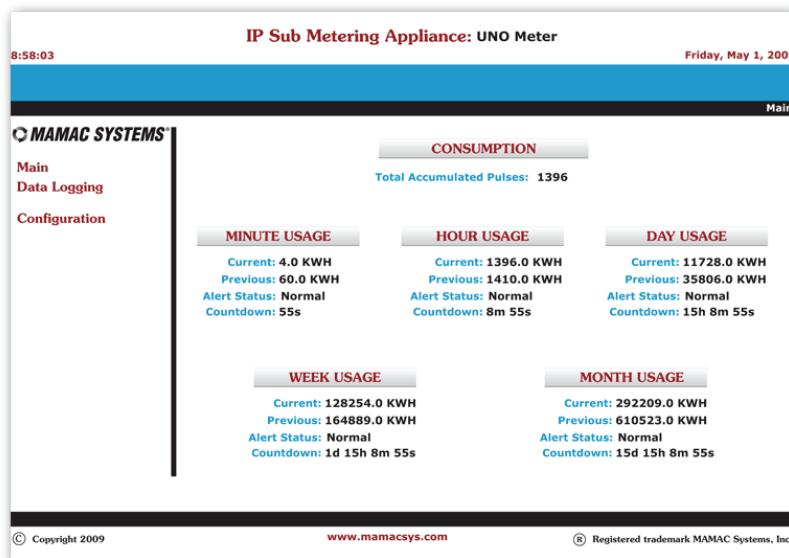
Connect the pulse input as shown in Figure 3 (Section 1.4.2). Power up the appliance. As soon as the Maverick comes on line, it will search for a DHCP server and lease a new IP assignment. As soon as it gets a new DHCP IP, it will send an email to one or both email addresses with the new DHCP IP. Once you receive the email, connect a laptop/PC, PDA or web-enabled mobile/cell phone to the same network and launch the web browser. Enter the appliance internal IP address and connect. Each time the DHCP server assigns a new IP to the appliance, an email will be generated to keep the user abreast of the latest DHCP-assigned internal IP of the Maverick.



SECTION 3 - Main Page

3.1.0 After the initial configuration, any web browser running on a laptop/PC, PDA or a web-enabled mobile/cell phone can connect to the appliance. The Maverick will serve up the *Main* page displaying consumption by the Minute, Day, Week, Month and Year. For each time period, there is a countdown timer for the time remaining in the current period. The previous period value is also displayed. **Alert Status** for each period consumption is also shown. If consumption for any period crosses the programmed value, the **Alert Status** will switch from **Normal** to **Alert** in red color. The appliance uses AJAX and XML to update the values on the *Main* page without refreshing the whole page. As a result, one second updates for consumption data is possible.

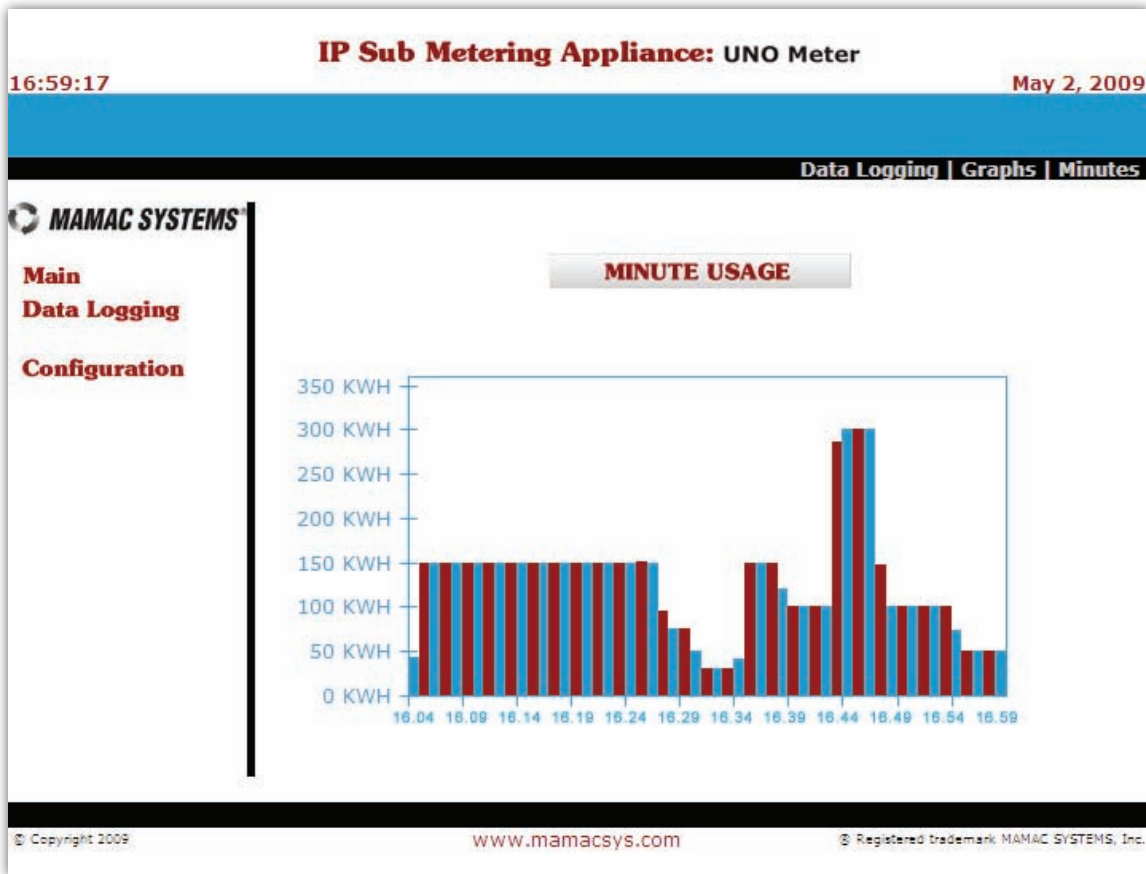
3.1.1 The Maverick also displays the **Total Accumulated Pulses** value on the *Main* page. This value is the number of total pulses since the last reset. All current data (hour, day, week, month, year), except current minute consumption, is stored in power-backed-up RAM memory and protected for seven (7) days without power. In the event of a power outage, only the current minute data is lost. If the previous minute, hour, day, week, month and year data needs to be protected, we recommend using a small UPS.



SECTION 3 - Data Logging

3.1.2 Data Logging: The Maverick logs data in a CSV (Comma Separated Values) file which can be imported into NotePad, WordPad, Word or Excel. To view a CSV file of the logged data, navigate to the **Data Logging** icon on the navigation bar and highlight **CSV**. Click the desired time period: **Minute, Hour, Day, Week, Month** or **Year**. The appliance will serve up the data. To **Save** or to **Import** the CSV file, click **File** on the browser navigation bar and highlight **Save As**. Enter a file name and save the data on the laptop/PC or PDA. Once saved, the file can be imported into any application which accepts CSV file format or emailed.

To view the logged data as a bar graph, again highlight **Data Logging** in the navigation bar, select **Graphs**, and click the desired time period. The Maverick will initialize a JavaScript and graph the data.



SECTION 3 - Reset Button & XML

- 3.2.0 Reset Button:** If the user misplaces the appliance *IP address* or forgets the *password*, the **RESET** is designed as a *Back Door*. If any of the above happens, press and hold the **RESET** button for more than **20 seconds** until the *Heartbeat* LED stops pulsing; release the switch. The *Maverick IP Address, Username, and Password* configuration will revert back to factory defaults.
- 3.3.0 XML:** The appliance has XML embedded with formatted input and output data. Each data field has an XML tag defined. To view all XML tags, connect to the *Maverick* with any browser and then in the address bar of the browser enter the following: **Appliance_IP/sm101.xml**. As an example, if the appliance is set up with the default IP to review XML tag page enter **192.168.1.10/sm101.xml** in the browser address bar, and the *Maverick* will serve up the XML TAG page as seen in Figure 7. For additional information on XML, please review TI IP XML.

Figure 7

```
<?xml version="1.0" encoding="iso-8859-1" ?>
- <Maverick xmlns="http://mamacsys.com/sm101" version="2.00" >
  <NodeID>UNO Meter</NodeID>
  <CurrentTime>15:16:51</CurrentTime>
  <CurrentDate>Friday, May 1, 2009</CurrentDate>
  <GlobalCount>15600</GlobalCount>
  - <Minute id="minute">
    <CurrentMinute>581</CurrentMinute>
    <PreviousMinute>827</PreviousMinute>
    <MinuteAlert>Normal</MinuteAlert>
    <Units>KWH</Units>
  </Minute>
  - <Hour id="hour">
    <CurrentHour>34860</CurrentHour>
    <PreviousHour>49620</PreviousHour>
    <HourAlert>Normal</HourAlert>
    <Units>KWH</Units>
  </Hour>
  - <Day id="day">
    <CurrentDay>836640</CurrentDay>
    <PreviousDay>1190880</PreviousDay>
    <DayAlert>Normal</DayAlert>
    <Units>KWH</Units>
  </Day>
  - <Week id="week">
    <CurrentWeek>5856480</CurrentWeek>
    <PreviousWeek>8336160</PreviousWeek>
    <WeekAlert>Normal</WeekAlert>
    <Units>KWH</Units>
  </Week>
  - <Month id="month">
    <CurrentMonth>175694400</CurrentMonth>
    <PreviousMonth>250084800</PreviousMonth>
    <MonthAlert>Normal</MonthAlert>
    <Units>KWH</Units>
  </Month>
</Maverick>
```