

# A3 ALPHA<sup>®</sup> Meter/Collector

Product Guide

PG42-1005A



## General Description

The A3 ALPHA meter/collector is the communications point between the EnergyAxis System and the local network of REX meters that are registered to the meter/collector. The EnergyAxis System communicates with the A3 ALPHA meter/collector using a standard telephone line. The A3 ALPHA meter/collector then communicates with its registered REX meters using a 2-way, 900 MHz radio frequency network. The A3 ALPHA meter/collector is responsible for various activities within the network of REX meters, including the following:

- reading and storing the billing data from each REX meter on a periodic basis
- reading and storing the load profiling data from a configurable number of REX meters on a periodic basis
- notifying the REX meters to perform demand resets based on a schedule from the EnergyAxis System
- reading and storing the previous billing period data from REX meters after a demand reset has occurred
- notifying the REX meters to perform season changes based on a schedule from the EnergyAxis System
- reading and storing the previous season data from REX meters after season changes have occurred
- synchronizing the REX meters to the system time and TOU day type
- distributing TOU rate schedules to the REX meters
- reading or sending commands to an individual REX meter on command from the EnergyAxis System
- performing other network maintenance tasks
- reporting the billing and load profiling data back to the EnergyAxis System

## A3 ALPHA Meter Circuit Board

The A3 ALPHA meter builds upon the strengths of the existing ALPHA meter designs. Like its predecessors, the A3 ALPHA meter uses Elster Electricity's patented digital measurement techniques that offer high accuracy, repeatability, and low ownership costs. In support of open architecture standards, the A3 ALPHA meter is the first Elster Electricity meter with full ANSI C12.18, C12.19, and C12.21 communication protocol support.

To function as an A3 ALPHA meter/collector, an A3 ALPHA meter requires the following two option boards:

- internal telephone modem (ITM3) with optional outage reporting capabilities
- internal LAN controller (ILC1) option board

The ITM3 option board connects to the A3 ALPHA meter using the 20-pin header (J4) on the meter circuit board as shown in Figure 1. The ILC1 option board connects to the ITM3 option board using the 20-pin header (J5) as shown in Figure 1.

An A3 ALPHA meter/collector has a 4-conductor telephone cable exiting the meter with an RJ-11 connector at the end as shown in Figure 2. There is a wire marker approximately 6 inches from the RJ-11 end with "INT MOD ITM3" printed on it for identifying that the ITM3 option board is installed.

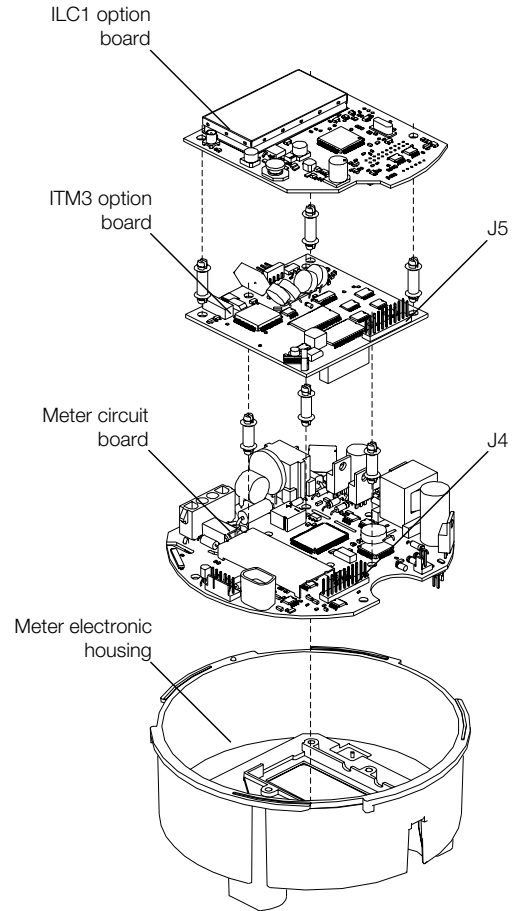


Figure 1. A3 ALPHA meter electronic assembly

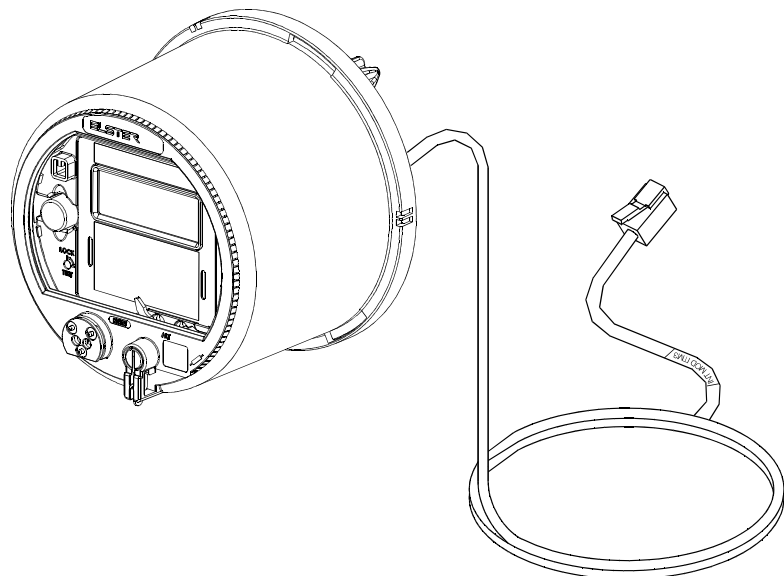


Figure 2. A3 ALPHA meter with ITM3 RJ-11 cable

## Metercat Programming Note

To have the A3 ALPHA meter function properly as a data collector in the EnergyAxis System, it is important that the meter be programmed correctly using Metercat. In the Remote component tab in Metercat, be sure that the following options are set:

- Port 1 usage is set to internal modem.
- Port 2 usage is set to direct connect.
- On the Port 1 Modem tab, enable line sharing (the Enable Line Sharing box is checked).
- On the Port 2 Direct Connect tab, the bit rate is set to 9600.

The other options can be set as desired. For more information on using Metercat, see the Metercat documentation.

## Elster Electricity Meter Support Software

### Metercat

The A3 ALPHA meter/collector requires Elster Electricity Metercat support software release 1.4 or later to program the meter for collecting REX meter data and read the LAN status and information from the meter. Metercat offers the following features:

- program development to create user-defined configuration data
- meter programming to send user-defined configuration data or commands to the meter
- meter reading to receive data that has been stored by the meter

### EnergyAxis Metering Automation Server

The EnergyAxis Metering Automation Server (MAS) reads meters over telephone or wireless networks. Using MAS, meter readings can be scheduled on a periodic basis or performed on-demand from the browser-based user interface. MAS allows all billing data to be read from the meter; this includes data from the A3 ALPHA meter/collector and from each REX meter. Billing data includes multi-channel interval data, consumption, demand, time-of-use registers as well as meter status flags. REX meter data can be read from the stored data in the A3 ALPHA meter/collector or it can be read directly from the REX meter. MAS provides several reports to help manage and operate the system.

Data exchange with MAS is performed using an open XML schema, AMR Data Exchange Format (AMRDEF), so that interfaces with billing systems and other enterprise systems can be easily implemented. MAS also comes with the JSlinger module, a powerful driver for file transfer protocol (FTP) that can transform, compress and encrypt data files prior to sending them to trusted IP addresses across the Internet.

## **Operation of the A3 ALPHA Meter with ILC1 Option Board**

The A3 ALPHA meter and the ILC1 option board typically operate independently of each other. The primary task of the ILC1 option board is to maintain the local area network (LAN) and read and store billing data from REX meters. The ILC1 option board communicates with the A3 ALPHA meter/collector to read time and day type information. This information is then propagated through the LAN to the REX meters. The time base in the A3 ALPHA meter/collector is used as the system time for the LAN, and the ILC1 option board periodically reads this time and distributes the time to the LAN.

### **Billing Date**

The billing date (or, the demand reset date) for the A3 ALPHA meter/collector can be controlled by either of the following:

- internally by the calendar in the A3 ALPHA meter
- externally by MAS when the MAS calls the A3 ALPHA meter/collector on the billing date and issues a demand reset command

Billing dates for REX meters in the LAN are handled by the ILC1 option board. The ILC1 option board can assign each REX meter to one of thirty billing dates. Using the billing date information, the ILC1 option board will make certain that the associated REX meters reset demand on the correct billing date. Before resetting demand, a REX meter will record a copy of the billing data. This billing data copy will then be read and stored by the ILC1 option board.

### **TOU Schedules**

If the A3 ALPHA meter/collector is a TOU meter, TOU switch points are controlled by the A3 ALPHA meter. The ILC1 option board controls TOU switch points for REX meters in the LAN. Each REX meter can be assigned to one of seven TOU schedules, where each schedule consists of weekday, weekend, and two special (that is, holiday) day types. The ILC1 option board broadcasts the TOU schedules to the REX meters, where they are stored and used to record kWh data in the correct TOU register. The ILC1 option board reads and stores TOU data from each REX meter as part of the normal billing read.

### **Season Changes**

Season changes for the A3 ALPHA meter/collector are controlled by the calendar in the A3 ALPHA meter. Season changes for the REX meters are controlled by calendars in the ILC1 option board. The ILC1 option board has season change dates for each of the seven TOU schedules. Using the season change information, the ILC1 option board makes certain that the associated REX meter perform a season change on the correct date. After a season change, the ILC1 option board will read and store a season change copy of the billing data from associated REX meters.

## Call Initiation

The A3 ALPHA meter/collector can initiate billing, alarm, and outage/restoration calls based on the customer program configured in the meter. The ILC1 option board can initiate alarm to report the following conditions:

- An additional REX meter has been registered to this A3 ALPHA meter/collector
- A REX meter's demand threshold has been exceeded (the REX meter must be enabled to report this condition to the A3 ALPHA collector)
- Power has been restored to a REX meter (the REX meter must be enabled to report this condition to the A3 ALPHA collector)
- Warning conditions related to REX meters with an internal service disconnect switch (the REX meter must be enabled to report this condition to the A3 ALPHA collector)

For each of these exceptions, the ILC1 option board can be configured to initiate a call at the following times:

- never
- immediately
- after a configurable delay of 1 to 255 minutes
- daily

Telephone calls initiated by the ILC1 option board use the A3 ALPHA meter's alarm telephone number.

## Power Fail

When there is a power failure, the A3 ALPHA meter initiates a shutdown and stores the A3 ALPHA meter billing data and status information in EEPROM. All billing data information stored in the ILC1 option board is stored in battery-backed RAM. The A3 ALPHA meter's real-time clock and the data stored in the ILC1 option board is maintained by the super capacitor and battery during a power failure.

If the super capacitor and battery fail, all RAM in the meter and in the ILC1 will be lost. Upon power restoration, the LCD will display a carryover error for both the A3 ALPHA meter data (see the A3 ALPHA Meter Technical Manual TM42-2190) and the ILC1 option board data (see ILC1 Option Board Error Codes).

## Loss of Real Time

Within the network, the REX meters obtain real time from time signals sent by the A3 ALPHA meter/collector. The ILC1 option board does not have its own real time clock; instead, it obtains the time directly from the A3 ALPHA meter. There are two ways the ILC1 option board can lose time from the A3 ALPHA meter:

- A3 ALPHA meter has lost its timekeeping capability
- the ILC1 option board cannot communicate with the A3 ALPHA meter

When real time is lost, all REX meters in the network revert to relative timekeeping and store all energy data in the default rate. Additionally, the A3 ALPHA meter LCD will indicate the ILC1 option board's loss of real time by displaying an error code (see ILC1 Option Board Error Codes for more information).

## Reading the A3 ALPHA Meter/Collector

The A3 ALPHA meter/collector can be read in the following ways:

- visually using the LCD
- remotely using the ITM3 option board and Elster Electricity meter support software

For more details on the information that can be read on the LCD, see "Display List Items."

Using the telephone modem, Table 1 shows the information that can be obtained from the A3 ALPHA meter/collector.

*Table 1. Information available remotely*

Category	Items	Indicates
LAN controller status	▪ Hardware version	Hardware version of the ILC1 option board
	▪ LAN ID	Complete A3 ALPHA meter/collector LAN ID
	▪ Firmware version	ILC1 option board firmware version number
	▪ Utility ID	A utility's unique ID for all meters within its network
	▪ Firmware S-Spec	Manufacturer identifier of the ILC1 option board firmware
	▪ User shared memory	The amount of memory used in the ILC1 option board for storage (including such things as load profiling records and billing data for each REX meter)
	▪ LAN node types	Whether the A3 ALPHA meter is operating as a node or a collector in the network
	▪ Available shared memory	The amount of storage available on the ILC1 option board
LAN status	▪ Errors	A condition that affects the operation of the ILC1 option board
	▪ Registered nodes	The number of REX meters that are registered to the A3 ALPHA meter/collector and the unique identification number (LAN Id) of the registered nodes.
	▪ Repeaters	The number of REX meters that are registered to the A3 ALPHA meter/collector that are operating as a repeater
	▪ Event list	The date and time of the most recent of the following events: <ul style="list-style-type: none"> <li>▪ REX meter read (start and stop)</li> <li>▪ REX meter load profiling read (start and stop)</li> <li>▪ node scan (start and stop)</li> <li>▪ partial load profiling read (start and stop)</li> <li>▪ A3 ALPHA meter/collector time broadcast</li> <li>▪ Clear REX meter registration</li> </ul>
Billing data	▪ Communication statistics	For each REX meter, the number of read/write as compared to the number of successful reads/writes.
	▪ Current billing data	Billing data is available for each REX meter registered to the data collector. For a list of the specific data that can be read from a REX meter, refer to the REX meter technical manual (TM42-2210A).
	▪ Previous billing period data	
	▪ Previous season billing data	
▪ Load profile data		

For more details about the items available through the ITM3 option board, see the Elster Electricity meter support software documentation.

### Changing an A3 ALPHA Meter with ILC1 Option Board

**▲ WARNING**

Use authorized utility procedures to remove metering equipment. Dangerous voltages are present. Equipment damage, personal injury, or death can result if safety procedures are not followed.

If the A3 ALPHA meter/collector must be taken out of service (because of an error condition, the telephone modem fails, etc.), the A3 ALPHA meter/collector can be replaced with another A3 ALPHA meter/collector.

Since the REX meters within the network register with a meter/collector, a change out procedure needs to be performed to make certain that the REX meters will communicate with the new A3 ALPHA meter/collector. Follow these steps to change out an old meter/collector with a new meter/collector:

- 1 Before beginning the change out procedure, verify that the new A3 ALPHA meter/collector is properly configured (see Metercat Program Development Guide for specific details).
- 2 Using Metercat software, perform a billing or diagnostic read on the old A3 ALPHA meter/collector. Be certain to include storage mode (either append or replace) and all of the internal LAN controller data in the read.
- 3 Make a note of the old A3 ALPHA meter/collector LAN ID obtained from the billing or diagnostic read performed in step 2.
- 4 Remove the old A3 ALPHA meter/collector from service. (See A3 ALPHA Meter Technical Manual for specific details).
- 5 Install the new A3 ALPHA meter/collector. Be sure to follow the installation instructions that are provided with the A3 ALPHA meter/collector to correctly install the meter/collector.
- 6 Using Metercat software, perform the "Change Out LAN Collector" function. (See Metercat user Guide for specific details). The old A3 ALPHA meter/collector LAN ID obtained in step 3 will be needed to complete the change out function.

After the change out command is performed, the REX meters will re-register with the new A3 ALPHA meter/collector.

### Display List Items

The A3 ALPHA meter display can be divided into different regions as shown in Figure 3. See Chapter 3, "Operating Instructions," in the A3 ALPHA meter technical manual (TM42-2190) for more detailed descriptions of the LCD and its display regions.

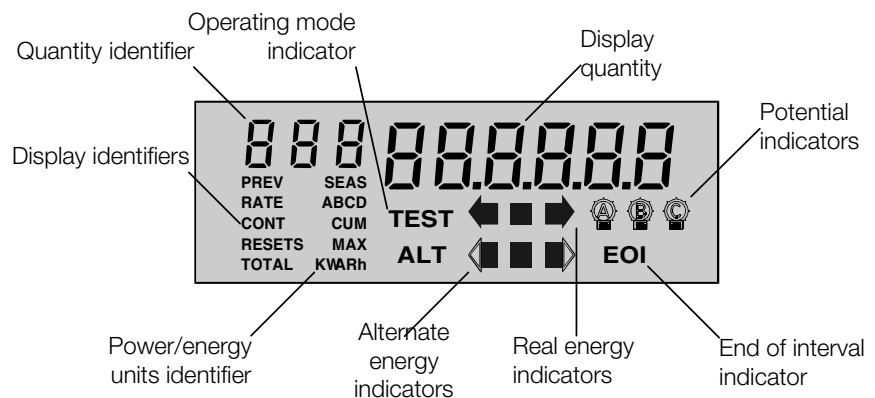


Figure 3. A3 ALPHA meter LCD



The display format for all displayable items, including the items relating to the ILC1 option board, can be programmed using Elster Electricity meter support software.

### ILC1 Option Board Error Codes

Unlike A3 ALPHA meter error codes, ILC1 option board error codes must be programmed as displayable items in the A3 ALPHA meter display list; otherwise, the meter LCD will not display any indication that a condition exists that affects the ILC1 option board's operation. Table 2 identifies the ILC1 option board error conditions and the associated display quantity value. The quantity identifier is the same for all ILC1 option board error codes and can be any numeric character (represented by i in Table 2).

Table 2. Error conditions and codes

Condition	Quantity identifier	Display quantity value
No error	iii	000000
Clock error	iii	000001
Carryover error	iii	000010
Table CRC error	iii	000100
Configuration error	iii	001000
Shared memory error	iii	010000
Power fail data save error	iii	100000

Error codes may be displayed in combination (for example, iii-100001) indicating that more than one error condition has been detected.

**No error.** This code is displayed when no error condition exists in the ILC1 option board. Since ILC1 option board error codes must be programmed as display items, the no error code is used when no error condition is present in the ILC1 option board.

**Clock error.** This code indicates an error with the timekeeping ability of the ILC1 option board. The ILC1 option board can lose its real time clock if the A3 ALPHA meter has lost its timekeeping capability or if the ILC1 option board cannot communicate with the A3 ALPHA meter. When this condition is present, all REX meters in the network revert to relative timekeeping and store all energy data in the default rate.

**Replace the meter battery.** The ILC1 option board periodically attempts to read time from the A3 ALPHA meter (the ILC1 option board reads the time every 15 minutes by default). The ILC1 error will clear after the ILC1 successfully communicates to the A3 ALPHA meter and reads a valid time. The error code should be cleared within 15 minutes of the time the battery is replaced. If the error code continues to be displayed, return the A3 ALPHA meter with ILC1 option board to Elster Electricity for repair or replacement.

**Carryover error.** This code indicates that the ILC1 option board's battery-backed RAM was not maintained during a power failure. When there is a power failure, battery-backed RAM on the ILC1 option board is maintained by the A3 ALPHA meter's super capacitor or battery. If both of these fail, the data stored in RAM is lost. The meter battery may need to be replaced. The ILC1 option board error will be cleared remotely by the MAS.

**Table CRC error.** This code indicates a possible error in the ILC1 option board's

programming. This error may be corrected remotely by the MAS. If the error code is displayed after reprogramming, return the A3 ALPHA meter with ILC1 option board to Elster Electricity for repair or replacement.

General configuration error. This code indicates a problem with the ILC1 option board's configuration or program. The error may be corrected remotely by the MAS. Contact Elster Electricity if this error code continues to be displayed on the LCD.

Shared memory error. This code indicates that one of the following conditions has occurred:

- The amount of memory requested by the ILC1 program exceeds the amount of physical memory present.
- The shared memory configuration has been changed and a clear data command has not been performed.

Shared memory on the ILC1 option board is used to allow the number of registered meters and the number of meters for which the ILC1 option board stores profile data to be varied to meet specific applications. The ILC1 option board will support a maximum of 1024 registered nodes. The amount of memory required to store current billing data, previous period billing data, and previous season data limits the amount of data available for storage of load profile data. There are two variables that control the amount of shared memory required to store load profile data:

- The number of REX meters for which load profile data is to be stored.
- The number of days of data to store for each REX meter.

As these two load profile variables are increased, the maximum number of registered nodes must be decreased to allow all of the data to fit within the available shared memory on the ILC1 option board.

If a shared memory error exists, it can be corrected remotely by the MAS. Contact Elster Electricity if this error code continues to be displayed on the LCD.

Power fail data save error. This code indicates that the data saved in the ILC1 option board's nonvolatile memory during a power fail may be invalid. This error will be displayed when power is restored to the meter if a self check has discovered an error with the ILC1 option board's memory. This error can be corrected remotely by the MAS.

### ILC1 Option Board Status Codes

For ILC1 status codes to appear on the A3 ALPHA LCD they must be programmed as displayable items. Status codes indicate the operational status of the ILC1 option board. Unlike error codes, the status codes do not indicate a problem with the ILC1 option board. Table 3 identifies the status condition and its associated display quantity value. The quantity identifier is represented by i in Table 3.

*Table 3. Status condition and code*

Condition	Quantity identifier	Display quantity value
Collector operation	iii	000001

Collector operation. This code indicates that the A3 ALPHA meter is operating as a collector. While operating as a collector, the A3 ALPHA meter is collecting and storing REX meter data.

### ILC1 Option Board Information

ILC1 option board information can be displayed on the A3 ALPHA meter LCD. ILC1 option board information are items that are not associated with any particular error condition. Table 4 identifies all the items that are available for display. The quantity identifier must be a numeric character (represented by i in Table 4) and should be unique for each item that you want to display. Use Elster Electricity meter support software to select the display items and their associated quantity identifier.

Table 4. Information items and display format

Display item	Quantity identifier	Display quantity value
REX LAN ID 2	iii	xxxxxx
REX LAN ID 1	iii	xxxx
REX utility ID	iii	xxxxxx
ILC number of nodes	iii	xxxxxx
ILC number of repeaters	iii	xxxxxx

REX LAN ID 2. This item displays the last 6 digits of the ILC1 option board LAN ID.

REX LAN ID 1. This item displays the first 4 digits of the ILC1 option board LAN ID.

REX utility ID. This item displays the utility ID for the A3 ALPHA meter/collector. The utility ID is the same for all meters that are part of a network.

ILC number of nodes. This item displays the number of REX meters that are registered to the A3 ALPHA meter/collector.

ILC number of repeaters. This item displays the number of REX meters that are registered to the A3 ALPHA meter/collector and that are operating as a repeater.

### Memory Capacity

The ILC1 option board has configuration parameters that determine how much data can be stored. Table 5 through Table 7 show the estimated number of days of load profiling intervals available, depending on the following factors:

- length of the REX meter's load profiling interval
- number of REX meters the A3 ALPHA meter/collector has registered

Table 5 through Table 7 assume that the A3 ALPHA meter/collector reads and stores load profiling data for all registered nodes.

Table 5. Maximum number of days of load profiling storage available based on 15-minute load profiling intervals

<b>REX meters allowed to register</b>	<b>Days of LP storage</b>
35	40
70	20
100	14
250	5
500	2
1024	1

Table 6. Maximum number of days of load profiling storage available based on 30-minute load profiling data intervals

<b>REX meters allowed to register</b>	<b>Days of LP storage</b>
70	40
100	28
250	11
500	5
1024	2

Table 7. Maximum number of days of load profiling storage available based on 60-minute load profiling data intervals

<b>REX meters allowed to register</b>	<b>Days of LP storage</b>
140	40
250	22
500	11

## **FCC and Industry Canada Compliance**

### **Compliance Statement (Part 15.19)**

The A3 ALPHA meter/collector complies with Part 15 of the FCC Rules and with RSS-210 of Industry Canada. Operation is subject to the following two conditions: 1) This device may not cause harmful interference, and 2) This device must accept any interference received, including interference that may cause undesired operation.

### **Warning (Part 15.21)**

Changes or modifications not expressly approved by Elster Electricity, LLC could void the user's authority to operate the equipment.

### **RF Radiation Safety Guidelines per Part 2 of FCC Rules and Regulations**

The meter should be installed in a location where there will be a separation greater than 20 cm from locations occupied by humans.

### **User Information (Part 15.105)**

The A3 ALPHA meter/collector has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Move the receiving equipment farther away from the A3 ALPHA meter/collector.
- Consult the dealer or an experienced radio/TV technician for help.

### **Industry Canada Statement**

The term "IC" before the certification/registration number only signifies that the Industry Canada technical specifications were met.

# Technical Specifications

## Absolute Maximums

Voltage	Continuous 528 VAC	
Surge voltage withstand	<b>Test performed</b>	<b>Results</b>
	ANSI C37.90.1 Oscillatory	2.5 kV, 2500 strikes
	Fast Transient	5 kV, 2500 strikes
	ANSI C62.41	6 kV @ 1.2/50 μs, 10 strikes
	IEC 61000-4-4	4 kV, 2.5 kHz repetitive burst for 1 minute
Current	ANSI C12.1 Insulation	2.5 kV, 60Hz for 1 minute
	Continuous at Class Amperes	
	Temporary (1 second) at 200 % of meter maximum current	

## Operating Ranges

Voltage	<b>Nameplate nominal range</b>	<b>Operating range</b>
	120 V to 480 V (May have to be form dependent due to emissions issues. We should know the answer to this early next week)	96 V to 528 V
Current	0 to Class amperes	
Frequency	Nominal 50 Hz or 60 Hz ± 5 %	
Temperature range	-40 °C to +85 °C inside meter cover	
Humidity range	0 % to 100 % noncondensing	

## Operating Characteristics

Power supply burden (Phase A)	Less than 4 W		
Per phase current burden	0.1 milliohms typical at 25 °C		
Per phase voltage burden	0.008 W @ 120 V	0.03 W @ 240 V	0.04 W @ 480 V
Accuracy	Meets ANSI 12.20 accuracy for accuracy class 0.2 %		

## General Performance Characteristics

Starting current			
Form 1S and Form 3S	10 mA for Class 20	100 mA for Class 200	160 mA for Class 320
All other forms	5 mA for Class 20	50 mA for Class 200	80 mA for Class 320
Startup delay	Less than 3 seconds from power application to pulse accumulation		
Creep 0.000 A (no current)	No more than one pulse measured per quantity, conforming to ANSI C12.1 requirements		
Primary time base	Power line frequency (50 Hz or 60Hz), with selectable crystal oscillator		
Secondary time base	Meets the ANSI limit of 0.02 % using the 32.768 kHz crystal. Initial performance is expected to be equal to or better than ± 55 seconds per month at room temperature		
Outage carryover capacity	6 hours at 25 °C. Supercapacitor rated at 0.1 Farads, 5.5 V		
Battery (optional)	LiSOCl <sub>2</sub> battery rated 800 mAh, 3.6 V and shelf life of 20+ years. Five years continuous duty at 25 °C		
Communications rate	Optical port	9600 baud (nominal)	
	ITM3 option board	1200 bps or 2400 bps	
	ILC1 900 MHz radio	17600 bps	

## Applicable Standards

ANSI	C12.1	C12.10	C12.20	C12.18	C12.19	C12.21
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