Aclara

EV2c RF™ Module

Installation and User Guide

Y84587-2-TUM
Revision A
www.Aclara.com

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Table of Contents

CHAPTER 1

INTRODUCTION

Purpose

This document intends to lay groundwork for the installation, use, and maintenance of the **eRF Network Interface Card (NIC) in the Aclara EV2c**.

Audience

This document is intended for Aclara customers that have signed a Non-Disclosure Agreement.

Scope

This document identifies the capabilities of the eRF Network Interface Card (NIC). The document will discuss installation, use, and maintenance of the product.

Applicable Industry Standards

The product is required to comply with the following industry specifications as listed in *Applicable Industry Specifications & Standards* on page 1.

Table 1.1 Applicable Industry Specifications & Standards

Reference	Document Title	Document Number
CEC	Canadian Electrical Code	CSA C22.1
FCC OET Bulletin 65	Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields	OET Bulletin 65, Edition 97-01, August 1997
NEC	National Electrical Code	NFPA 70
Safety Code 6	Limits of Human Exposure to Radio Frequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz. (Consumer and Clinical Radiation Protection Bureau, Environmental and Radiation Health Sciences Directorate, Healthy Environments and Consumer Safety Branch, Health Canada.)	Safety Code 6 (2015)

Tools Required

- Volt Ohm Milliampmeter (VOM)

Optional Tools

- Spectrum Analyzer

Support

Aclara Connect

Aclara's customer portal (https://connect.aclara.com) enables you to access our frequently-updated knowledge database, easily access product documentation, submit and track your Support cases and RMAs, access Aclara University's Online Learning Center (OLC) and learning library, track your orders, join communities and groups, join in discussions with other Aclara customers and Aclara personnel, and much more. If you do not have access to Aclara Connect, email AclaraSupport@Hubbell.com and request access.

Aclara University

Aclara's on-demand training makes content available to you in a convenient, cost-effective online environment. The OLC has recordings of several webinars, streaming educational videos, software simulations, and short videos which walk you through a specific task. Access the OLC by going to Aclara Connect and clicking the Aclara University link.

Technical Support

Email AclaraSupport@Hubbell.com or call 1-800-892-9008 to speak with an Aclara representative.

CHAPTER
2

SAFETY GUIDELINES

Shock Hazard Warning

DANGER Shock hazard

Electricity can cause burns and interfere with the operation of the heart.

Working with electricity can be hazardous. Wear appropriate PPE and observe all applicable safety procedures. The PPE should include insulating gloves, safety glasses, and any other equipment required by the utility or the circumstances of the installation.

RF Exposure Hazard

NOTICE RF exposure hazard

The equipment will begin communicating once it powers up. This will expose people nearby to RF energy, however an analysis of the power levels finds that the levels are safe per FCC and Health Canada recommendations.

Users are advised to maintain a distance of 20 cm or more from the meter, or a bank of meters, in order to minimize exposure levels.

ESD Caution

NOTICE Electrostatic discharge may damage equipment.

Repairs to the meter should only occur in the meter shop. Wear suitable ESD protective gear, such as grounding straps, when servicing equipment, or return the equipment to the factory for repair.

Replacement Parts

NOTICE Incorrect repair parts may result in equipment damage or create an unsafe condition.

Return the equipment to the factory for repair.

Inspect Antenna Clearance

NOTICE Risk of performance issues

RF energy can be shielded by nearby materials. Proximity to metal walls or fences can inhibit the transmission of RF energy and affect system performance. If the meter is surrounded by metal or in a basement, make note. Further attention may be required at this location.

NOTES Section 4 indicates the directivity of the antenna. The directivity of an installed meter's antenna may be somewhat different than the published value depending on nearby metals.

A portable spectrum analyzer may be used to determine the power received at a given location at that moment in time.

CHAPTER 3

REGULATORY GUIDELINES

It is important that the installer follow all applicable national, regional, and local codes. Failure to do so could result in an unsafe condition or injury. It may also create a situation in which interference is created by the operation of the equipment.

This manual will provide examples which are meant to be examples only. Local and regional codes may require a different practice.

Supplier's Declaration of Conformity

Unique Identifier: Model Y84580-2

Responsible Party U.S. Contact Information:

FRN: 0004168324

Name : Aclara Technologies LLC

Address: 77 Westport Plaza Drive, Suite 500, St. Louis, MO 63146

Contact Person: Kumudika Prematilake

Phone: 314-895-6514

Email: kprematilake@hubbell.com

FCC/IC Compliance

NOTE This equipment 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, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC ID: LLBY845802

IC: 4546A-Y845802

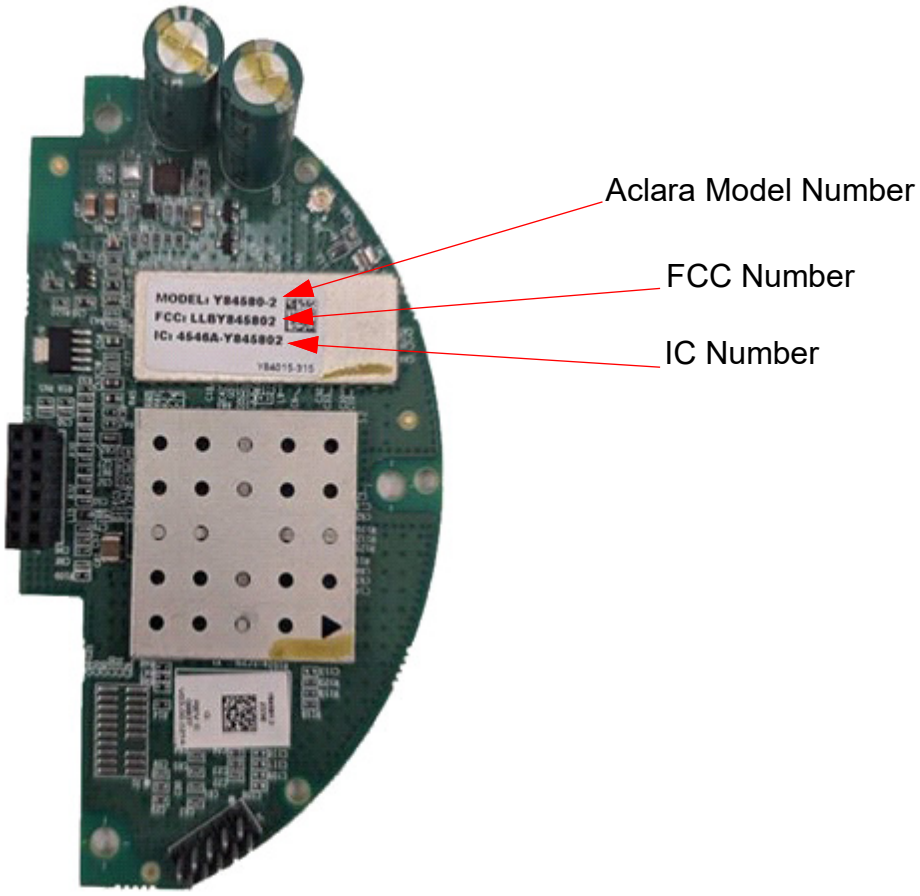
The antenna must not have a gain greater than: +1dbi.

NOTE If receiving antenna needs to reoriented or relocated, it must be done by an installer.

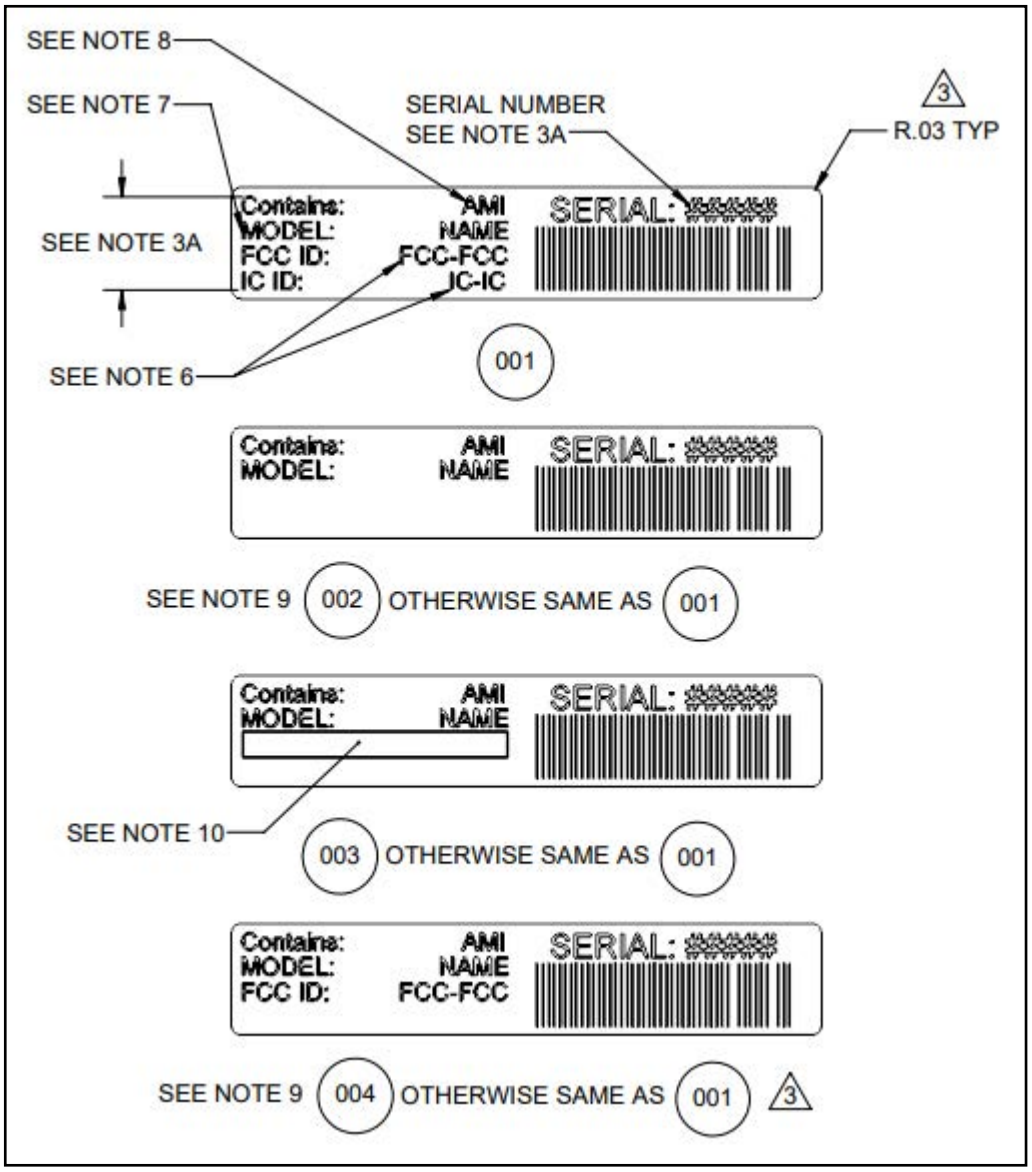
CAUTION Any changes or modification made to this device without the expressed, written approval of Aclara Technologies LLC may void the user's authority to operate this device.

Module and Host Labeling

The following image depicts information that is displayed on the label attached to the Aclara Network Interface Card (NIC).



The following image depicts information that shall be displayed on the label attached to the outside of the host enclosure.



Label Notes

Note 1 Material: 2 mil white polyester IAW UL category PGJI2, file number MH62163

Note 2 All text to be printed in black

Note 3 All text font type to be the following

- Arial, font size 8, black
- Arial, font size 6, black

Note 4 A quiet zone between the beginning and ending edges of the barcode and label edges is required

Note 5 Barcode: Code 39; digi MAC address with text information is that of the board assembly that is assembled to the meter

Note 6 FCC ID and IC certificate numbers come from the specific board that is assembled to the meter; the specific numbers **FCC ID: LLBY845802** and **IC 4546A-Y845802** must be on the outside label

Note 7 Model Name is that of the specific board that is assembled to the meter

Note 8 AMI Partner Name comes from the specific board that is assembled to the meter

Note 9 Label used for non-RF type AMI applications (FCC and/or IC certification text omitted)

Note 10 Refer to attribute sheet for text to print

FCC/IC RF Exposure Guide

Aclara Technologies LLC low power RF devices and their antennas must be fixed-mounted on indoor or outdoor permanent structure(s) providing a separation distance of at least 1 meter from all persons during normal operation. This device is not designed to operate in conjunction with any other antennas or transmitters. No other operating instructions for satisfying RF exposure compliance are needed.

Holding the antenna in one's hands while it is transmitting, or standing near a transmitting antenna for a prolonged period of time, could result in RF exposure that exceeds FCC and Health Canada recommendations.

This device has been tested for exposure of humans to RF energy. It satisfies OSHA, FCC, and Health Canada requirements provided it is installed in a manner described in this manual and operated in accordance with the user guide.

Field Calibration Procedure

Aclara Technologies LLC low power RF devices have passed through extensive testing and calibration procedures while in the factory. Therefore, no additional calibration or adjustment is required in the field.

Conformité FCC/IC

Cet équipement a été testé et il est conforme aux limites pour un appareil numérique de Classe B, en vertu de l'article 15 des règlements de la FCC. Ces limites sont conçues pour offrir une protection raisonnable contre l'interférence nuisible dans une installation résidentielle. Cet équipement génère, utilise et peut émettre de l'énergie de fréquences radio et, s'il n'est pas installé ou utilisé conformément aux instructions, il peut causer une interférence nuisible aux communications radio. Il n'existe toutefois aucune garantie que de telles interférences ne se produiront pas dans une installation particulière. Si cet appareil cause des interférences nuisibles à la réception des signaux de radio ou de télévision, ce qui peut être détecté en mettant l'appareil sous et hors tension, l'utilisateur peut tenter de neutraliser l'interférence de l'une ou l'autre des façons suivantes:

- Réorienter ou repositionner l'antenne de réception.
- Augmenter la distance séparant l'équipement du récepteur.
- Connectez l'équipement à une prise sur un circuit différent de celui auquel le récepteur est connecté.
- Consultez le revendeur ou un technicien radio/TV expérimenté pour obtenir de l'aide.

MISE EN GARDE Tout changement ou toute modification à cet appareil sans l'approbation écrite expresse d'Aclara Technologies LLC peut annuler l'autorisation de l'utilisateur d'utiliser cet appareil.

Ce produit est conforme à la norme FCC et aux limites d'exposition au rayonnement RSS-102 d'Industrie Canada définies pour un environnement non contrôlé.

Cet appareil est conforme à des règlements Innovation, Sciences et Développement économique Canada exempts de licence standard RSS (s). Son fonctionnement est soumis aux deux conditions suivantes: (1) Ce dispositif ne doit pas causer d'interférences nuisibles, et (2) cet appareil doit accepter toute interférence reçue, y compris les interférences pouvant entraîner un fonctionnement indésirable.

Guide d'exposition aux RF FCC/IC

Les appareils RF à faible puissance Aclara Technologies LLC ainsi que leurs antennes doivent être montés de manière fixe sur des structures intérieures ou extérieures permanentes qui se trouvent à au moins 1 metrè des personnes pendant le fonctionnement normal. Cet appareil n'est pas conçu (et il n'a aucun branchement externe) pour être utilisé en association avec toute autre antenne ou tout transmetteur. Aucune autre instruction d'utilisation n'est requise pour assurer la conformité aux règles d'exposition aux RF.

Procédure de calibration sur place

Les appareils RF à faible puissance Aclara Technologies LLC ont été soumis à des tests étendus et multi-tâches et à des procédures de calibration complexes en usine. Par conséquent, ils ne requièrent pas de calibration ni d'ajustement supplémentaire sur place.

Licensing

The equipment you are installing has received a grant from the FCC (US) and from the ISEC (Canada) to operate. Its FCC ID and IC ID numbers are printed on the equipment label. It is expected that this equipment will be licensed to operate in the country in which it is installed as mobile equipment (even though it is stationary). US CFR 47.90 and other regulations restrict the elevation of the antenna and restrict the power transmitted. It is expected that the utility has worked with Aclara to obtain the necessary license for the frequencies for which the equipment will be programmed to operate.

CHAPTER

4

PRODUCT SPECIFICATIONS

Description of Operation

The Aclara RF Network Interface Card (NIC) provides a wireless communication interface for an Aclara electric meter or host device.

The NIC creates a remote interface to the host device, through a serial communication port, using a narrow band 450MHz to 470MHz RF transceiver. The maximum RF output power of the Communication Board is 1W.

The primary power source of the Aclara RF NIC is a DC power supply provided by the host device. The NIC also contains an auxiliary power storage circuit and power supply to provide temporary power to the NIC when the primary service voltage is interrupted. That auxiliary power storage and power supply allow short messages to be transmitted indicating when main power has been lost.

The Aclara RF Network NIC uses a 16-bit microcontroller to control all functions, including RF transceiver operations. The NIC has a 32.768kHz crystal, which is used for time keeping, an 8MHz oscillator for clocking the CPU, and a 30MHz TCXO used by the RF transceiver IC for command processing and RF frequency synthesis.

Emission Designator: 8K25F1D

Data Rate	4800 Baud
Encoding	Reed-Solomon (255, 239)
Number of Data Bits	1448 bits max
Transmission Duration	151mS
Modulation	4GFSK with +/-3.0kHz Dev Typ.

Table 4.1 Product Specifications

Specification	Description
eRF I-210+c NIC (Endpoint) Hardware Version	Y84580-2
Aclara RF NIC (Endpoint) Firmware Version	03.00.0219 (I-210+c RA6 firmware) 03.00.0233 (EV2c RA6 firmware)
AclaraONE Release	1.10 or later
Endpoint quiescent power consumption	1.5W
450 MHz Band antenna port output power	+30.3dBm (conducted)
450-470 MHz band receiver sensitivity	-98dBm maximum receiver sensitivity at 10^{-5} BER @ 4800 BAUD with 4GFSK modulation having 1kHz tone separation; directed in the most favorable heading
Frequency Band	450-470 MHz
Note: The radio is configurable to operate in numerous specific 12.5 kHz channels within the 450-470 MHz band.	
Transmission Rate	4800 BAUD (which, when operated with 4GFSK modulation, provides 9600 bps).
Antenna Impedance	50 Ohms
Antenna Gain	The antenna peak gain is +1dBi.
Note: Mounting the device in an environment near metal will affect the antenna pattern.	
Altitude	Operation to 5000 ft. elevation above sea level
NIC Operating Temperature Range	-40° to +85°C (inside the device), 0 to 95% relative humidity (non-condensing)
Last Gasp repetition	Up to 6 messages over the course of 20 minutes when starting with fully charged super capacitors (supercaps)
Real Time Clock power ride-through capability	20 minutes
Daily Shift Message Capacity	32 measurements
On-Request Read message Capacity	32 measurements
Demand Reset Message Capacity	32 measurements
LP Channel Capacity	8 channels
Notes: The storage duration varies as a function of the way LP data collection is defined. Refer to the Meter User Guide, Chapter 5, Section R_2 for more information on LP storage duration. The choice of Interval data transmission rates will have a profound impact on system bandwidth utilization when large quantities of meters are deployed. The baseline system will be designed to handle 4 channels of 15-minute interval data transmitted every 15 minutes. Configurations which increase the number of channels, decrease the interval size and transmission rate, or both, can increase the bandwidth requirements for the system beyond its baseline capability. Such configurations must be limited to be a small percentage of the overall population, or the infrastructure hardware capacity must be increased above baseline levels, in order to deliver large amounts of fine resolution LP data.	

Figure 4.1 shows that a field of invisible RF energy is pushed outward from the RF transmitter located inside the meter canopy. Due to antenna directivity, more energy will propagate out the face of the meter than the back of the meter. The energy is directed primarily in the horizontal plane at the same elevation as the meter, but some energy is directed a few degrees above and below the horizontal.

Figure 4.1 RF propagation concept

Ideally there is line of sight between the meter and the DCU. However, there are quite often building materials, foliage, vehicles, terrain, and/or the curvature of the Earth in the way. The RF will transmit through many building materials, be absorbed by some, and bounce off others. If a sufficiently strong, vertically polarized signal reaches the receiver, the message will be received. This is true of RF transmissions from the meter to the DCU, and from the DCU to the meter.

Compliance Declarations

FCC Part 15 Compliance

This device complies with Part 15 of the FCC Rules.

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.

NOTE The Grantee is not responsible for any changes or modifications not expressly approved by the party responsible for compliance. Such modifications could void the user's authority to operate the equipment.

FCC Part 90 Certification

This device has been certified as a Part 90 compliant device. The AMI label on the face of the meter will list the various certified components located within the enclosure by their FCC ID.

RSS-GEN Compliance

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device.

RSS-GEN Compliance

Cet appareil contient des émetteurs/récepteurs sans licence qui sont conformes aux RSS sans licence d'Innovation, Sciences et Développement économique Canada. L'exploitation est soumise aux deux conditions suivantes:

1. Cet appareil ne doit pas provoquer d'interférences.
2. Cet appareil doit accepter toute interférence, y compris les interférences susceptibles de provoquer un fonctionnement indésirable de l'appareil.

ISED Certification

This device has been ISED certified. The meter AMI label will list the various certified components located within the enclosure by their IC ID.

RF Exposure

This device has been tested for exposure of humans to RF energy. It satisfies OSHA, FCC, and Health Canada requirements provided it is installed in a manner described in this manual and operated in accordance with the user guide.

CHAPTER 5

FEATURES

Supported Messages

The Aclara RF Electric Network customer configuration worksheet describes several types of messages:

- Daily Shifted (DS)
- Demand Reset (DR)
- Interval Data
- On-Request Read (OR)

Daily Shifted and Interval Messages

Typically, every day at midnight (the default daily shift time) the day begins with a series of "daily shifted" readings. These readings are described on the customer configuration worksheet with the "DS" designation.

All throughout the day the meter is collecting LP data. In the Aclara RF Network I-210+c, the LP data collected is specified by the meter program. The Aclara RF Network NIC will discover how the meter is programmed and send every programmed channel up to the headend in periodic intervals. By default, 15-minute interval data is collected and transmitted every 15 minutes. However, it is possible to batch the data into larger groups and send the interval data less frequently. Intervals of energy readings are typically reported as incremental (delta) values, while channels of temperature and voltage are reported as absolute values. Generally speaking, it is a good idea to ensure that every channel of delta data sent in as interval data has a corresponding absolute value which is transmitted in the Daily Shifted data message.

Measurements are transmitted with full meter resolution.

Demand Reset

Demand may be reset several different ways. The more common approach is to form a group of meters to be reset at the headend using the job scheduler, then issue the commands over the air to individual meters.

It might be noted that there are two demand reset lockout periods. One is enforced by the NIC (and prevents remote demand resets from occurring.) Another lockout is enforced by the metering platform. It prevents lockouts from occurring locally. Aclara recommends that present and previous demand values be reported via the

daily shift mechanism to maximize the availability of this critical billing data. To prevent accidental double resets, we recommend that the demandResetLockoutPeriod parameter in the module be set to 24 hours.

The customer configuration worksheet will describe which Reading Types are to be returned to the headend in the DR message response.

End Device Events

The Aclara RF Network system supports the notion of real time and opportunistic alarms.

On Request Reading

The customer configuration worksheet defines what the NIC will generate in response to an on-request read. (This is done by placing “OR” in the cells which indicate the desired readings.)

The DCU converts the message to RF and transmits it to the NIC. The NIC processes the request by fetching fresh readings from the meter. It transmits the response to the DCU. The DCU buffers and sends the message over the backhaul to the headend.

Power Outage and Restoration

When a power outage begins, a timer starts counting in the NIC. The NIC will wait until the Outage Declaration Period has lapsed to ensure that the outage is a not a momentary interruption. If the interruption is sustained, a “last gasp” message will be sent to the headend. As the outage continues, additional messages will be sent. As many as 6 messages may be sent within the first 20 minutes of the outage.

When power is restored, a “power restored” message is sent to the headend.

Trace Route

Users at the headend may ping a meter by using the Traceroute command. As the command travels through the system, it will accumulate a history of timestamps when it arrived and departed each piece of equipment. It will also, for the radio portions, collect Received Signal Strength Indications (RSSI) in dBm. When the signal strength approaches the lower limits described in the specifications, communication will become unreliable.

Other Messages

Other messages are sent over the network beyond the ones depicted here. These activities include:

- NIC firmware downloads
- NIC reconfiguration
- Historical recovery of daily shifted data
- Historical recovery of interval (LP) data
- Historical recovery of end device events (alarms)
- Meter firmware patch
- Meter reconfiguration (meter programming)
- Publication of engineering statistics
- Security certificate updates

Traffic Classification

The Aclara RF Network utilizes the concept of a traffic class to categorize the priority and urgency of a message. Messages from the headend that are deemed “high reliability” will be repeated multiple times by a given DCU and may be transmitted by more than one DCU. High priority messages will take precedence over lower priority messages in the DCU queues.

Ordinarily, RF infrastructure is deployed so that multiple DCUs cover the communication to each meter on each house. This DCU overlap is used to relate the findings within one survey to the findings of other surveys.

If the service infrastructure is not contiguous, or if overlapping units are not found, the results from the original reference survey cannot be joined with the results from the isolated locations. One or more additional reference meters must be installed and identified at these other locations.

The installer must take careful notes as to the serial number of the reference meters and their phasor connections. This information must then be entered into a configuration table at the headend. The pieces will then be in place to allow the system to run surveys, collect measurements, analyze them, join surveys, filter noise, and ultimately determine the phase connections of the meters.

NOTE There is nothing special about the reference meters. The hardware is not different than any other meter. The installer's notes, and the claim by the installer to know the phase connection with good authority, is what makes a reference meter different from any other meter.

Table 5.1 Example Phasor Name to Number Mapping

Phasor Number	Phasor Name
p10	-B
p11	AB

The headend will offer a mapping configuration in which phasor names may be attributed to phasor numbers. The Phasor Name attributed to each Phasor Number is configurable at the headend for a number of reasons:

1. The reference meter(s) may be placed on any phase. The system must be configured to accommodate their location.
2. The utility may not wish to make the distinction between a phasor and its inversion, e.g., AB and BA.
3. The utility may not wish to use the letters ABC but XYZ or some other naming convention.

It is expected that multiple surveys will be required before sufficient data has been collected to render a result. With surveys issued once a day, it may take several days of data collection before sufficient data is available. As deployments roll out, one may also find that an inadequate number of meters have been deployed, or that sufficient DCU infrastructure has not been deployed. A full analysis will likely have to wait for a full deployment to occur, however, it is still possible to test the system in a small-scale setting or in the lab.

If one or more meters appears to not converge to a solution for the phase connection, there may be an underlying issue that is preventing it. The possible causes include:

- Incorrect headend or DCU configuration: The headend must have a traffic class selected to send the phase detect beacon (resource "/pd") as a low reliability message. It must only be transmitted one time by the DCU. The high reliability traffic class will cause the DCU to repeat the message. This will create multiple messages with the same beacon ID. Most (but not all) duplicate transmissions will be rejected by the endoint population. The end result will be disagreement in the data as to what the correct measurement is for every phase being measured, and poor results from the analyzer.
- Poor power quality at the service location: Poor power quality can disrupt all sorts of devices including the phase detect function in the meter. Customers may note that numerous other electronic devices misbehave. Locations with poor power quality will likely have high counts of momentary interruptions. Leading causes of poor power quality include:
  - failed components on the distribution network
  - high impedance faults
  - noisy loads

- Intermittent RF communication
  - Fringe reception; this occurs when there is a great distance between the meter and the nearest DCU or hilly terrain between the meter and all DCUs
  - Inadequate data collection due to incomplete infrastructure installation
  - A large vehicle parked immediately in front of the meter blocking the communication path to the nearest DCU.
  - Occasional RF spillover into the licensed band from other RF sources (which has not yet been reported to the FCC for investigation)

Sites that experience these problems will require more samples from the field equipment. The user at the head end should schedule additional surveys (or simply wait longer if surveys are being run periodically.) It may also help to perform phase detect surveys at various times during the day. Usually the level of noise in the distribution network is lower at off peak times of day. Vehicles which block the meter during off-peak times may be moved out of the way during peak times of day. It may also be necessary for some units to collect data when the wind is relatively calm and tree limbs are not slapping the line.

Supported Modes of Operation

NIC Modes

Once the NIC has powered up in the field, it may go into several different modes of operation. These are depicted in the preceding image. When an outage occurs, it stops reading the meter and publishing readings. Instead it goes into a power-conserving mode and sends last-gasp messages. When power is restored, it goes back into the normal mode and transmits a power restored alarm message. Similarly, while in the normal operating mode, it can accumulate firmware download packets and meter reconfiguration files. When the download is complete, they can be applied. A firmware upgrade causes the module to temporarily go offline and reboot.

Supported Alarms

Alarms can come from many sources. These include:

- Last-gasp and power-restored messaging (from the NIC)

The NIC processes alarms by logging them and storing them in one of two messaging queues. One queue is for alarms published in real time, and the other for alarms which are published opportunistically (i.e. at the next opportunity - riding along with other data which is being published anyway.) Alarms have a default priority assigned to them. Alarms which have a priority above the real time alarm threshold (>170) are sent immediately in a dedicated alarm message. Alarms which have a priority which fall below the opportunistic alarm threshold (≤ 85) are discarded. Alarms between the two thresholds (85-170) are sent opportunistically.

To disable an alarm which originates in the meter, the meter must be programmed (configured) to not generate that alarm. In this way, unwanted (nuisance) alarms can be masked so that they are not communicated to the headend.

Table 5.2 Aclara RF Network I-210+c Supported Alarms

IEC 61968-9 Description	IEC 61968-9 Appendix E Code	Priority	Comment	Required Switches
electricMeter.security.tilted	3.12.0.263	105	Tilt alarm (including inversion)	E2
electricMeter.Security. magneticSwitch. tamperCleared	3.12.66.291	105	High intensity magnetic field no longer detected	
electricMeter.Security. magneticSwitch. tamperDetected	3.12.66.257	105	High intensity magnetic field detected	
ElectricMeter.Power.Current. ImbalanceCleared	3.26.6.75	102	Current imbalance cleared	
ElectricMeter.Power.Current. Imbalanced	3.26.6.98	102	Current imbalance detected	
electricMeter.power.reactive Power.normal	3.26.294.37	102		E2
electricMeter.power.reactive Power.reversed	3.26.294.219	102	Leading kVArh	E2
ElectricMeter.Billing.RTP. Activated	3.20.94.4	100		E2
ElectricMeter.Billing.RTP. Deactivated	3.20.94.19	100		E2
electricMeter.clock.error	3.36.0.79	100	Clock error	
electricMeter.loadControl. SupplyCapacityLimit. EventStopped	3.15.139.288	100	Demand Limiting Period (DLP) has stopped	
electricMeter.power.current. MaxLimitCleared	3.26.6.73	100	Excessive current (above meter class amps) has ceased	E2

Table 5.2 Aclara RF Network I-210+c Supported Alarms

IEC 61968-9 Description	IEC 61968-9 Appendix E Code	Priority	Comment	Required Switches
electricMeter.power.current. MaxLimitReached	3.26.6.93	100	Excessive current (above meter class amps) for more than 0.5 seconds	E2
electricMeter.power.rotation .normal	3.12.93.37	100		
ElectricMeter.RCDSwitch. Voltage.Charged	3.31.38.15	100	asynchronous load side voltage present	
ElectricMeter.Security.Access .Downloaded	3.12.1.60	100	Meter reports it was read	
ElectricMeter.Power.Error	3.26.0.79	95	Service Error Detected	
ElectricMeter.Power. ErrorCleared	3.26.0.279	95	Service Error Cleared	
ElectricMeter.security. password.invalid	3.12.24.35	92		
ElectricMeter.security. password.unlocked	3.12.24.62	92		
ElectricMeter.IO.Disabled	3.0.60.66	91		
ElectricMeter.IO.Enabled	3.0.60.76	91		
electricMeter.power.rotation .reversed	3.12.93.219	90	Received kWh, reverse flow	

Alarm Notes

Meters can be configured to automatically perform a self read. The AMI NIC will also frequently ask the meter to perform a self-read. Since self-reads are commonplace in an AMI environment, it is recommended that MeterMate be used to disable self-read alarms.

When a demand reset occurs, the NIC will generate an alarm. If the meter also has event logging enabled, it will also attempt to capture the same event in its log. The NIC will comb through the log and send up this form of the event as well. In order to prevent duplicate logs, it is recommended that MeterMate be used to disable demand reset alarms.

When power is lost NICs will periodically generate a comDevice.power.failed alarm. Upon restoration the NIC will report a comDevice.power.restored alarm along with certain device data, such as voltage and start/stop timestamps. The I-210+c without a battery will most likely have lost its date and time during this power interruption. The NIC has special hardware to maintain a real time clock even in the absence of power for at least 24 hours. The NIC will supply the correct date and time to the meter after power-up. Since time is an important aspect of metering, the meter will alarm when its date is written. It will announce that it is being reprogrammed and issue an electricMeter.configuration.program.initialized alarm when time is written. This alarm won't be seen from meters that have a battery. Finally, when the meter event log is enabled, it is possible that

electricMeter.power.failed and electricMeter.power.restored alarms will be logged and then reported by the meter. These alarms are the meter's account of the power outage and may have timestamps that differ by a few seconds relative to the NIC's account of the same outage.

Recommended Endpoint NIC Configurations

The Customer Configuration Worksheet will allow certain network behaviors to be configured.

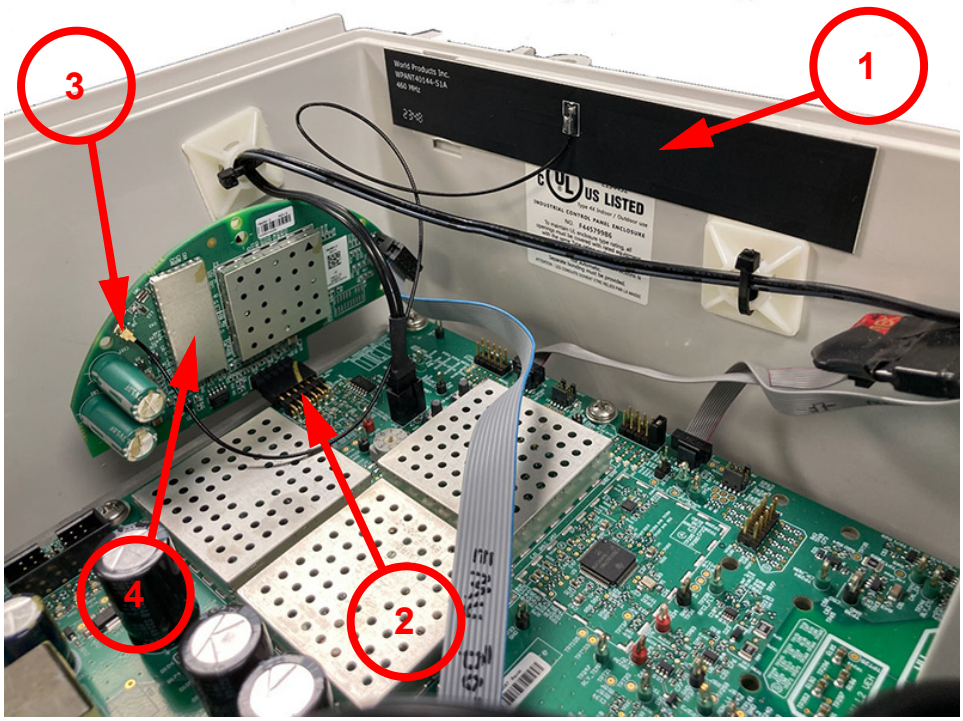
The bulk of the data transmitted through the network is the LP data from the meter. The I-210+c collects all channels at the same rate. However, they can be transmitted to the headend at a different rate than they are collected. If fresh data is required, intervals can be reported as soon as they are available by setting the lpBubbleupSchedule parameter to the same size as the interval. If network efficiency is more desirable, you can set the lpBubbleupSchedule parameter to be a larger size than the LP interval size, e.g., hourly reporting of 15-minute interval data. However queueing up too much data can be problematic too. No more than 4 intervals should be queued up in the message. On the other hand, going too small can create problems as well. The lpBubbleupSchedule parameter in the NIC should not be set to a smaller size than then LP interval size in the meter. The NIC can transmit 15-minute LP data every 15 minutes, but it should not be configured to send 15-minute LP data every 5 minutes.

CHAPTER
6

INSTALLATION

Network Interface Card (NIC) Installation Procedure

1. Verify the unit is powered down.
2. Follow appropriate ESD procedures and applicable safety guidelines.
3. Attach the antenna to the side of the enclosure (1).
4. Plug the Network Interface Card (NIC) into the appropriate connector on the metrology board (2).
5. Connect the antenna wire's UFL to the NIC's UFL (3).
6. Attach the FCC ID label to the NIC where indicated (4).



Index