



ACE1000-IRM Intelligent Radio Modem

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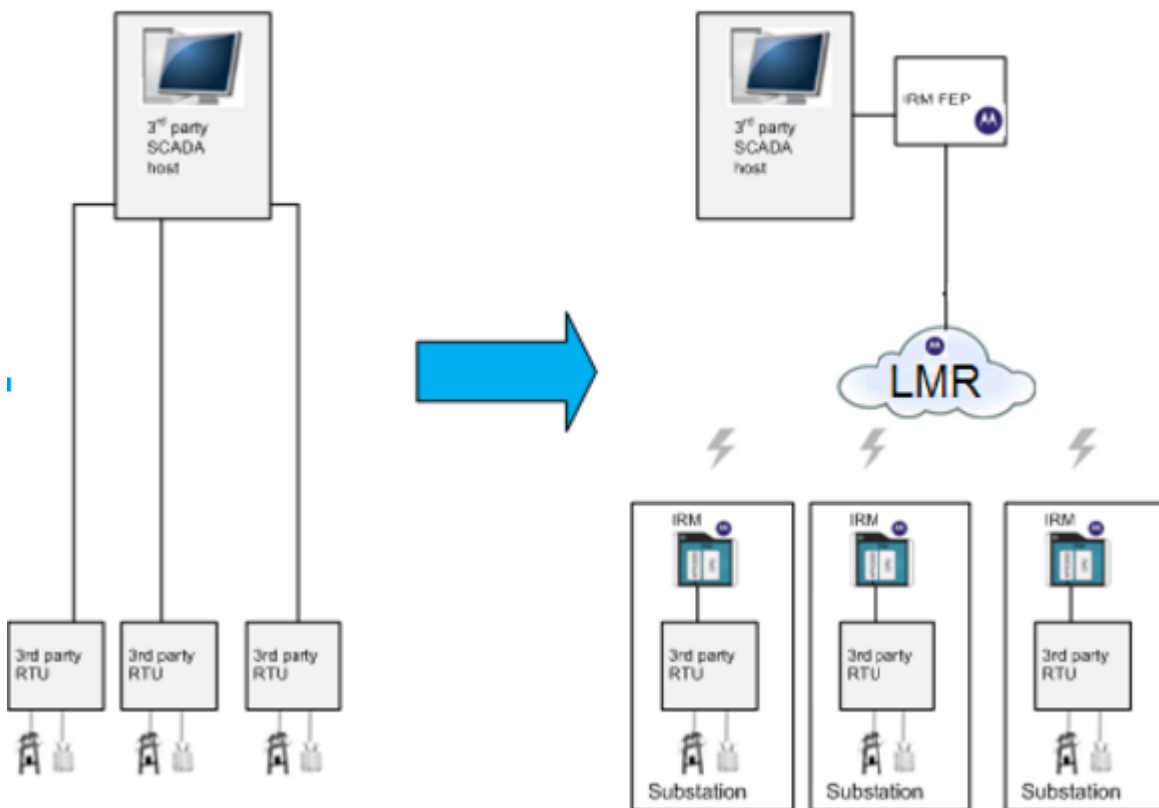
Chapter 1

ACE1000-IRM Product Overview

ACE1000-IRM is an Intelligent Radio Modem (IRM), used in SCADA systems, for data communication from substations and other distribution system sites over LMR (ASTRO P25, MotoTRBO) infrastructure. Using the ACE IRM unit, fixed grid assets (for example Remote Terminal Units, intelligent electronic devices, capacitor banks) can connect wirelessly to the SCADA application server.

The ACE IRM unit is a low-cost option which can be incorporated into the existing SCADA systems. It enables replacement of leased or owned 4W lines, cellular 3G\4G modules or private data radio systems while maintaining communication capabilities. The ACE IRM complements other Motorola SCADA solutions, such as the ACE3600 family of Remote Terminal Units (RTUs).

Figure 1: ACE1000-IRM Overview



1.1

ACE 1000-IRM System Components

This chapter provides a description of ACE 1000-IRM system components.

1.1.1

ACE 1000-IRM Overview

ACE1000-IRM transports incoming data from RS232/RS485 over the air, while utilizing the LMR infrastructure (currently supported MOTOTRBO and ASTRO), to the IRM server connected to the SCADA control center via LAN and the other way around.

ACE1000-IRM functionality operates on ACE1000-IRM dedicated HW device or as an ACE1000-IRM running on ACE1000 RTU. For ACE1000-IRM device support options, see [ACE1000-IRM over ASTRO on page 21](#), [ACE1000-IRM over MotoTRBO Connect Plus on page 23](#), and [ACE1000-IRM over MotoTRBO Digital Conventional on page 25](#).

1.1.2

IRM Server Overview

The IRM server acts as a terminal server, which represents each of the remote ACE IRM units, as a serial port over IP and provides a two-way path to the communication system and to remote ACE IRM units from the SCADA host entity.

1.1.3

Third-Party PLCs/RTUs/IEDs

Fixed grid assets, such as third-party PLCs (Programmable Logic Controllers) and RTUs (Remote Terminal Units), IEDs (Intelligent Electronic Devices), capacitor banks connected over RS232/RS485 to the ACE1000-IRM. ACE1000-IRM is transparent to the IED/RTU protocols. The IED detects the SCADA center applications as the direct communication recipient.

1.1.4

Third-Party SCADA Host Entity

The third-party SCADA host entity goal is to provide the operator the display and report tools which are necessary to view and manage the remote units (IEDs). The SCADA host entity obtains data from the remote units according to its requirements and typically presents that data on custom-created display formats.

The SCADA host is connected to the IRM server using the third-party's software virtual port redirector or serial IP redirector, providing one or more serial ports over TCP/IP towards the IRM server to one of the IRM server ports. Another option for the SCADA host is to use raw TCP/IP connection to the IRM server.



NOTICE: Several vendors provide redirector software for the PC including:

- Tactical Software Serial/IP Redirector (tested on the IRM1500) from <http://www.tacticalsoftware.com/virtual-serial-port-redirector/serial-ip-free-trial?gclid=CNalmPCh8ICFdQZtAod7DIAaA>.
- AGGsoftware TCP COM Bridge for multi port (trial version) from http://www.aggsoft.com/download/tcp-com-bridge_3jwKX4.exe.

1.1.5

ACE1000-IRM Communication Infrastructure

The ACE1000-IRM supports three types of LMR infrastructure.

The types of LMR infrastructure include:

- ASTRO P25
- MotoTRBO
 - Connect Plus
 - Conventional Digital



NOTICE: For the system view using a specific infrastructure refer to the related section in this document.

1.2

The Protocol between the IRM Server and ACE1000-IRM Units

This chapter provides information about the protocol for communication between the IRM server and ACE100-IRM devices.

1.2.1

The IRM Server and ACE1000-IRM Units Transfer Parameters

The IRM server and ACE1000-IRM units use LMR for user's data reliable transfer according to an existing protocol.

The basics for reliable data transfer:

The ACE1000-IRM protocol divides user data into slices before transmitting it. This process occurs in order to avoid overflowing the media and to have a reliable link. Each slice is transmitted and the peer provides the process completion confirmation before transmitting the next one. A “window size” parameter characterizes the slice length in bytes (8192 bytes by default). So for example, if the SCADA host transmits 500 bytes of data, it will be transmitted into a single window and a confirmation is expected following its transmission. The same applies to an outstation transmission to the SCADA host. As an example, to transmit 8192 bytes, the data must be broken down into four consecutive windows-2048 each. The ACE1000-IRM will transmit each window and expect a confirmation before transmitting the next one.

MDLC frames: It is also important to understand that the actual data transmitted over LMR is much smaller. An MTU (Maximal Transmit Unit) is specified in MDLC application per media (see reference to specific infrastructure type). The MDLC protocol breaks down each window into smaller granularity called frames. Each one of them constitutes up to 160 (180 including overhead) bytes, these frames are assembled into one transmission over the wireless media up to the size of MTU. After transmitting a series of four consecutive frames (i.e. up to 4x160, which is 640 bytes), no more transmission until a confirmation is received. This process has no concern to the user.

Number of Slots and Transmit queue delay time: In order to regulate transmissions and disable all ACE1000-IRM units transmit at the same time, this parameter specifies the number of ports which may be transmitted at the same time. Set it to 0 if all ACE1000-IRM units are to be transmitted simultaneously, or 1 to 15 have them transmitted one at a time with up to 15 at a time. Take 1, it means that transmission to other ports/channels is held pending until getting a confirmation from the current one. The parameter can range from 1 to 15 depending on number of available channels. (For default and recommended values see specific LMR type).

Three parameters characterize the IRM server protocol:

- **Window size in bytes** - Maximum number of bytes to transmit before expecting a confirmation. When transmitting larger packets, they are divided into slices of this size. The window size should be large enough to hold the user's application fragment.

- **TX Retry Interval** - The period of time that should elapse before a retry occurs. Note this does not reflect the expected time for the remote to confirm the complete window size but just for four consecutive MDLC frames (burst), up to $4 \times 160 = 640$ bytes.

- **Number of TX Retries** - The number of retries if an answer for a transmission was not received.

Connection management : A “keep-alive interval” parameter exists for detecting whether the connection with the peer unit is still open. Normally, it is set for a very long time, even a few hours. It can be either disabled (0) or set to a shorter interval, for example 30 seconds. We do not recommend altering it as this may load the radio channel. The MDLC can handle disconnect and lack of synchronization by transmit keep-alive when a detected channel broken.

Reception Idle time: The “Reception Idle timeout” parameter indicates the end of user data before transmitting; it is 50 milliseconds in the IRM server and 100 in the ACE1000-IRM. Setting this parameter to a higher value guarantees that the window sent is the complete user protocol fragment. Setting it to a low value may result in a smaller window size and a higher number of windows. As the maximum queue size is 32 messages, this may fill up the queue, resulting in error number 7550.

The ACE1000-IRM optimizes this process by assembling small windows into a large one (up to Window size in bytes) before transmission. So the “Reception idle timeout” does not dictate the actual data received by the peer. The user protocol should not rely its reception on idle time, but on the data itself, such as a start character followed by length, or end character. A checksum or CRC is also advised for detecting frame integrity.

Flow control is optional but may be supported by the ACE1000-IRM units over a serial port but only for RTS/CTS. The user is advised to refer to the ACE1000-IRM Owner's Manual for the exact connector to be used for RS232. Note again that the IRM server does not support any flow control emulation over TCP/IP with the virtual serial port on the PC. So these ports must be open as no flow control, even though the ACE1000-IRM may be set, have flow control with the outstation.

ACE1000-IRM also supports RS485 but on a limited scale. As there is no channel access, the user protocol should not be allowed for the polling of the outstation to occur while allowing to send reports or bursts to the SCADA. This may cause collisions and data loss within the RS485 media between ACE1000-IRM units and the outstation.

Data rate: Data rate between the ACE1000-IRM and the IED, or between the SCADA host to the IRM server may be 9600-115200 bps. The data rate does affect the protocol over the air, in such a way that the ACE1000-IRM will send a confirmation to the IRM server only when the complete window was received.



NOTICE:

- Each ACE1000-IRM unit includes these parameters as well, so if you change the default, you need to modify it in each ACE1000-IRM unit separately.
- By default, these parameters are the same for all units, but may be different.

1.2.2

ACE1000-IRM User Application Retry

If the user application in the PC (or in the outstation) expects a confirmation before deciding whether to retry, it is crucial to avoid such retries if possible, and to calculate that the interval is large enough.

M = user application message size, assuming it is less than or equal to the ACE1000-IRM Window size in bytes

T = MDLC TX retry interval

N = Maximum number of MDLC TX retries

B = MDLC burst size (by default 160 x 4 frames = 640 bytes).

User application retry should be larger than: $((M/B) + 1) \times T \times (N + 1)$

For example, in order to transmit 1500 bytes, expect confirmation within no less than 270 seconds before retrying.



NOTICE: The number of slots different than 0 may increase the maximum retry time in case ACE1000-IRM is not connected. For a low throughput media such as MOTOTRBO Digital conventional setting it to 1 will cause transmit one by one. You need to multiply the above with number of ports opened by SCADA.

1.3

ACE1000-IRM Capacity

Currently there are 24 IEDs supported by ACE1000-IRM (one per ACE1000-IRM unit).

If more IEDs are required in the system, additional IRM servers per each 24 IEDs are required (and an additional ACE1000-IRM unit). In order to ensure that each IRM server accesses only the ACE1000-IRM units it manages, IDs of all radios used in the system by the ACE1000-IRM units should be unique.

Since the IRM servers do not synchronize, the “number of slots” parameter is determined per an IRM server, not for the whole system. This means that the maximum number of simultaneous transmissions that can occur between different IRM servers and ACE1000-IRM units is the sum of the values of “number of slots” defined for each IRM server. The underlying infrastructure should have enough resources to accommodate this.

1.4

ACE1000-IRM Device

ACE1000-IRM functionality can be provided by either using the ACE1000-IRM dedicated HW device (for details refer to ACE1000-IRM portable section), or as an application running on ACE1000 RTU (for details refer to IRM APP 1500 Mobile).

1.4.1

ACE1000-IRM Portable

ACE1000-IRM Portable can include eight main components.

Table 1: Components possible to be included in the ACE1000-IRM

Component	Function	Notes
CPU	Communicates with the control center, RTUs and other devices via the communication ports.	
Internal radio	Enables IRM1500 communication.	See "IRM1500 Approved Radios" in <i>IRM1500 Owner's Manual</i>
Optional CPU plug-in board (future release)	Enables adding two additional plug-in RS232 communication ports to the IRM1500.	See "IRM1500 Communication Interfaces" in <i>IRM1500 Owner's Manual</i>
Optional WLAN plug-in board (future option)	Enables adding WiFi capability.	

Table continued...

Component	Function	Notes
115/230 VAC to 12VDC power supply or 115/230 VAC to 24VDC power supply	Converts the main AC power source to the voltages required by the unit/radio.	See "IRM1500 External Power Supply" <i>IRM1500 Owner's Manual</i>
RS232 cable + adaptor (FKN0022)	Connects devices to an RS232 port.	See "Appendix B: Cables and Adaptors" <i>IRM1500 Owner's Manual</i>
RS485 cable (FKN0030 #CB000207A01)	Connects devices to the RS485 port.	See "Appendix B: Cables and Adaptors" <i>IRM1500 Owner's Manual</i>
External DC power cable (FKN0033 #CB000170A01)	Connects the IRM1500 to an external power supply.	See "Appendix B: Cables and Adaptors" <i>IRM1500 Owner's Manual</i>
Ground cable (FKN0034 #30009286001)	Connects the IRM1500 to chassis ground.	
Optional WLAN antenna (#FAG0005) (future option)	Enables adding WiFi capability.	See "IRM1500 WLAN Antennas (Future Option)" <i>IRM1500 Owner's Manual</i>

For components of the IRM1500 server (IRM1100) see the *ACE1000 RTU Owner's Manual*.

1.4.2

ACE1000-IRM Application on ACE1000-IRM with Mobile/Portable Radio

The following table lists the components which can be included in the ACE1000-IRM Mobile\Portable.

Table 2: Components possible to be included in the ACE1000-IRM Mobile\Portable

Component	Function	Notes
CPU	Communicates with the control center, RTUs and other devices via the communication ports.	
External LMR radio	Enables IRM1500 communication	See <i>IRM1500 Approved Radios in the appropriate LMR type section</i> .
CPU plug-in board (future release)	Enables adding two additional plug-in RS232 communication ports to the IRM1500.	
115/230 VAC to 12VDC power supply or 115/230 VAC to 24VDC power supply	Converts the main AC power source to the voltages required by the unit/radio.	See <i>IRM1500 External Power Supply</i> .
RS232 cable + adaptor (FKN0022)	Connects devices to an RS232 port.	See <i>Appendix B: Cables and Adaptors</i> .

Table continued...

Component	Function	Notes
RS485 cable (FKN0030 #CB000207A01)	Connects devices to the RS485 port.	See <i>Appendix B: Cables and Adaptors</i>
External DC power cable (FKN0033 #CB000170A01)	Connects the IRM1500 to an external power supply.	See <i>Appendix B: Cables and Adaptors</i> .
Ground cable (FKN0034 #30009286001)	Connects the IRM1500 to chassis ground.	
External mobile radio installation kit	Enables installation of the external radio near the ACE1000 RTU. Includes brackets, cables, and screws.	See ACE1000 RTU Owners manual: ACE1000 Radio Types and installation kits

ACE IRM External Power Supply or Battery

ACE1000-IRM needs to be ordered with an external AC/DC power supply. These are drop ship items that are provided with the ACE1000-IRM. The following power supplies are available:

- Lambda Electronics DPP120-12-1 AC power supply 12VDC/10A, 120W, 90-264VAC (mounted on DIN rail) DC output
- Artesyn ADN5-24-1PM-C AC power supply 24VDC/5A, 120W, 85-264VAC (mounted on DIN rail) DC output, Limited temp. -25 - +70

Alternatively, a customer-supplied AC/DC power supply or DC power source (DC/DC converter or battery) can be used.

1.5

IRM Server Components

Table 3: Components possible to be included in the IRM server

Component	Function	Notes
CPU	Communicates with the control center, IRM1500 units via the communication ports	
External LMR radio	Enables IRM1500 server communication with IRM1500 units.	Applies only to MotoTRBO conventional digital. See "Approved Radios" section <i>IRM1500 Owner's Manual</i>
115/230 VAC to 12VDC power supply or 115/230 VAC to 24VDC power supply	Converts the main AC power source to the voltages required by the unit/radio.	See "IRM1500 External Power Supply" <i>IRM1500 Owner's Manual</i>
External DC power cable (FKN0033 #CB000170A01)	Connects the IRM Server to an external power supply.	See "Appendix B: Cables and Adaptors" <i>IRM1500 Owner's Manual</i>
Ground cable (FKN0034 #30009286001)	Connects the IRM Server to chassis ground.	

IRM Server External Power Supply or Battery

The IRM1500 needs to be ordered with an external AC/DC power supply. These are drop ship items that are provided with the IRM1500. The following power supplies are available:

- Lambda Electronics DPP120-12-1 AC power supply 12VDC/10A, 120W, 90-264VAC (mounted on DIN rail) DC output
- Artesyn ADN5-24-1PM-C AC power supply 24VDC/5A, 120W, 85-264VAC (mounted on DIN rail) DC output, Limited temp. -25 - +70

Alternatively, a customer-supplied AC/DC power supply or DC power source (DC/DC converter or battery) can be used.

Chapter 2

ACE1000-IRM over ASTRO

This chapter provides information about ACE1000-IRM over ASTRO infrastructure.

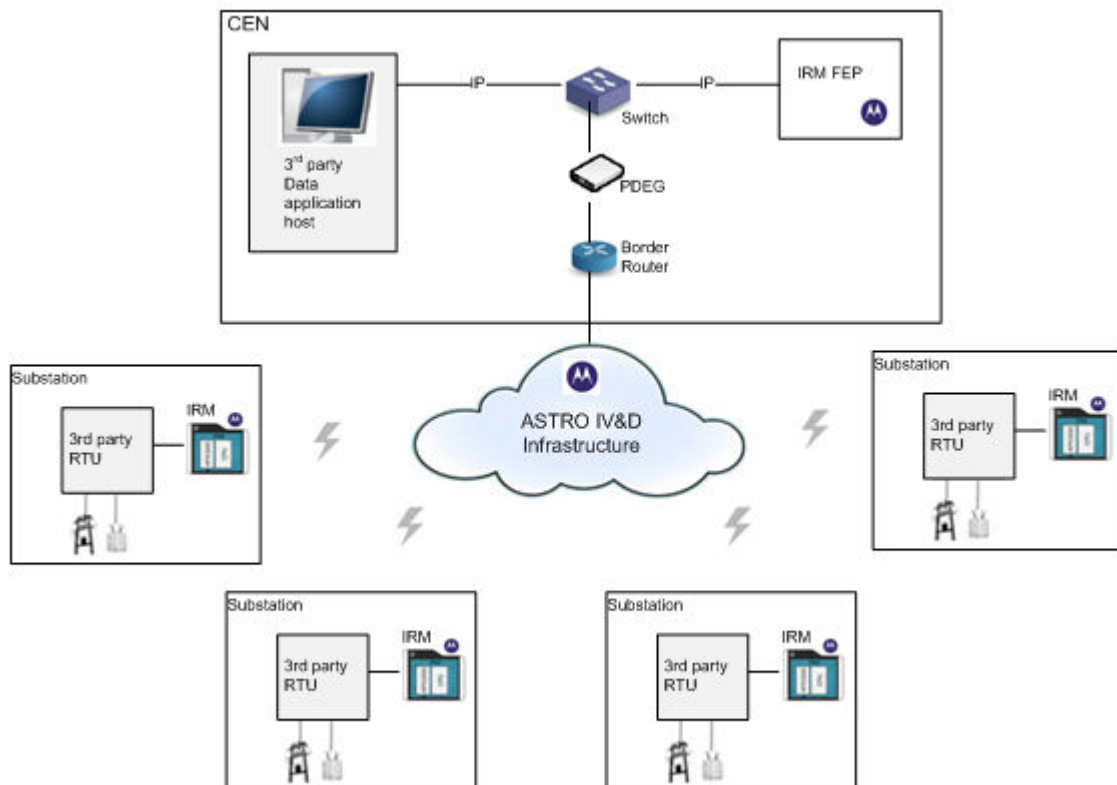
2.1

ACE1000-IRM over Astro System View

ACE1000-IRM on Astro operates via two main infrastructures: a built-in APX radio and an external APX mobile radio.

The following diagram shows ACE1000-IRM on the ASTRO P25 system. In this configuration ACE1000-IRM is connected to ASTRO IV&D infrastructure via its built-in APX radio. The connection to ASTRO IV&D is made via CEN (for the IRM-FEP) and via radio (for the IRMs). The CEN is connected via a border router gateway to the ASTRO IV&D infrastructure.

Figure 2: ACE1000-IRM on ASTRO P25 via a Built-in APX Radio



The following diagram shows a system where the IRM functionality is provided by ACE1000-IRM running on ACE1000 RTU that is connected to ASTRO IV&D infrastructure via an external APX mobile radio (connected via USB).

Figure 3: ACE1000-IRM on ASTRO P25 via an External APX Mobile Radio



2.2

IRM1500 over Astro System Design Guidelines-Protocol Parametres Default Values

The following information shows the default value for protocol parametres.

Window size - 8192 bytes

Number of slots - 1

MTU (Maximal Transmit Unit) - 0 (each frame transmitted separately)

Tx Retry interval - 30 seconds

Number of Tx Retries - 2

Reception Idle time:

- IRM server - 50 ms
- IRM1500 - 100 ms

2.3

Supported ACE1000-IRM Device Options

ACE1000-IRM supports three main devices.

The devices supported by ACE1000-IRM:

- ACE1000-IRM portable
- ACE1000-IRM on ACE1000 with mobile radio
- ACE1000-IRM on ACE1000 with portable radio

2.4

ACE1000-IRM on ACE1000 Supported Radio Models

For ACE1000-IRM on ACE1000 with mobile radio: **APX6500**

For ACE1000-IRM on ACE1000 with portable radio: **APX4000**



NOTICE: IRM1500 portable device has APX4000 radio built in.

Chapter 3

ACE1000-IRM over MotoTRBO Connect Plus

This chapter provides information about ACE1000-IRM over MotoTRBO Connect Plus infrastructure.

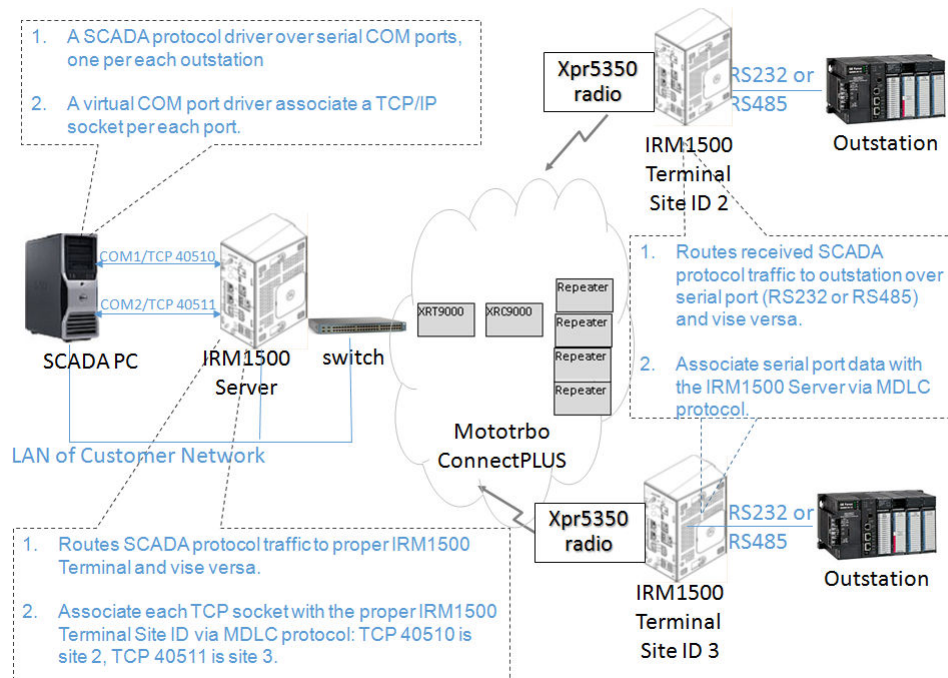
3.1

ACE1000-IRM System View

ACE 1000 RTU runs on ACE1000-IRM on connect plus system.

The following picture shows ACE 1000 RTU running ACE1000-IRM on connect plus system. In this configuration the IRM server is connected via LAN to the Connect Plus backbone, i.e. the XRT. The backbone also includes one or more XRC controllers and repeaters. The XRT serves as a data gateway from LAN to radio. Each ACE 1000 RTU running ACE1000-IRM is connected via USB to a MOTOTRBO mobile or portable radio.

Figure 4: ACE1000-IRM for MOTOTRBO CONNECT PLUS



3.2

System Design Guidelines-Protocol Parameters Default Values

The following information shows default values for protocol parameters.

Window size - 8192 bytes

Number of slots - 2

MTU (Maximal Transmit Unit) - 472 bytes

Tx Retry interval - 30 seconds

Number of Tx Retries - 2

Reception Idle time:

- IRM server - 50 ms
- IRM1500 - 100 ms

3.3

Supported ACE-1000IRM Device Options

The following device device is supported by ACE1000-IRM: ACE1000 with a mobile radio.

3.4

ACE1000-IRM Supported Radio Models

Supported Radio Models

- XPR5350e
- XPR5380e
- DM4400e
- DGM5000e
- DGM5000e

Chapter 4

ACE1000-IRM over MotoTRBO Digital Conventional

This chapter provides information about ACE1000-IRM over MotoTRBO Digital Conventional infrastructure.

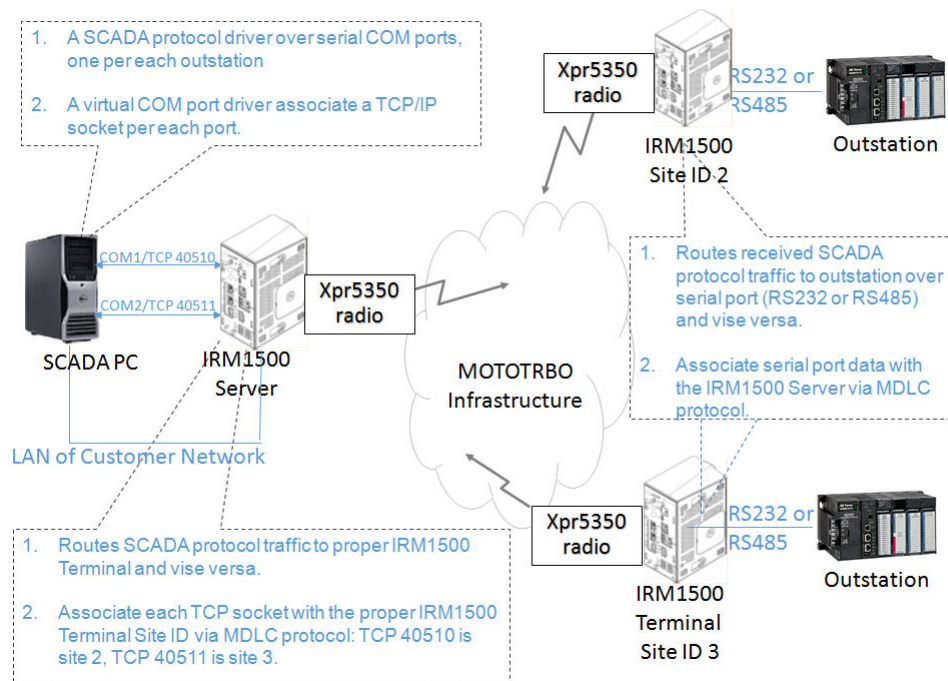
4.1

ACE1000-IRM over MotoTRBO Digital Conventional System View

ACE 1000 RTU runs on ACE1000-IRM over MOTOTRBO conventional digital system.

The following picture shows ACE 1000 RTU running ACE1000-IRM over MOTOTRBO conventional digital system such as a single repeater and IP Site connect. In this configuration the IRM server is connected via XPR5350 radio to the MOTOTRBO system. In here no data gateway from LAN to radio or IRM server has a direct connection via USB to XPR5350 radio as any control station. No DDMS or ARS is needed. Each ACE 1000 RTU running ACE1000-IRM is connected via USB to a MOTOTRBO mobile or portable radio. No Data gateway such (MNIS) is used in this configuration

Figure 5: ACE1000-IRM over MotoTRBO Digital Conventional System View



4.2

ACE1000-IRM System Design Guidelines-Protocol Parametres Default Values

The following information presents default values for protocol parametres.

Default Values for Protocol Parametres

Window size – 8192 bytes

Number of slots – 1

MTU (Maximal Transmit Unit) – 750 bytes

Tx Retry interval – 30 seconds

Number of Tx Reries – 2

Reception Idle time:

- IRM server – 50 ms
- IRM1500 – 100 ms

4.3

Supported ACE1000-IRM Device Options

ACE1000-IRM supports two main devices.

- IRM application on ACE1000 RTU with mobile radio
- IRM application on ACE1000 RTU with portable radio

4.4

ACE1000-IRM Supported Radio Models

The following radio models are supported:

Mobile:

XPR5350

XPR5380

DM4400

DGM5000

XIR-M8620

XPR5350e

XPR5380e

DM4400e

DGM5000e

XIR-M8620e

Portable:

XPR7550

XPR7550e

Chapter 5

ACE1000-IRM Ordering Guide

The following chapter provides information about ACE1000-IRM models and options selection and Field Replacement Unit.

5.1

Model Selection

The ACE 1000 family is comprised of four models. The FEP (Front End Processor) model is F0043A. A FEP is a 'master' module and is required to communicate to one or more 'slave' RTU (Remote Terminal Unit) ACE 1000 models. The three RTU models are the F0016A (Standard, non-ATEX compliant), F0043A (ATEX compliant), F0026A (ATEX compliant with Real Time Clock, reduced temperature spec). At this time, there is no support for direct ACE 1000 RTU-to-RTU communications. All four models include the necessary screw terminal inserts for the connectors on the CPU.

Description Nomenclature

ACE 1000 CPU 1010 MODULE

F0016A

ACE 1100 - FEP MODULE

F0043A

ACE 1000 CPU 1011 MODULE ATEX

F5209A

ACE 1000 CPU 1012 MODULE ATEX W/ RTC BATTERY

F0026A

- ACE IRM does not support I/O modules.
- Portable radio installation kit can be ordered Radio should be purchased in the region.

5.2

Options Selection

CPU Plug-in Board – There is a slot on the ACE 1000 and ACE1100 units for an optional plug-in board. There are currently 2 available options

- 2XRS232 PORT AUX PLUG-IN BOARD includes two RS232 ports and an aux power output
- MICROHARD N920 PLUG-IN BOARD. IOM data radio

The ATEX version of the plug in board (VA00046AA) does not provide an Aux power output. If no plug-in board is ordered with– a blank cover is installed on the CPU. The VA00006AA option includes the screw terminal connector for the aux power port.

Description Nomenclature

ADD: 2XRS-232 PORT / AUX PLUG-IN BOARD

VA00006AA

ADD: 2XRS-232 PORT PLUG-IN BOARD ATEX

VA00046AA

ADD: MICROHARD N920 PLUG-IN BOARD

VA00144AA

DIN Rail Installation Kit, Module Covers – When the WALL MOUNT INSTALLATION KIT is ordered, a number of din rails are generated according to the other options selected. For example, if no I/O Modules are ordered, a shorter length of din rail is provided – if I/O modules are ordered, a longer din rail is provided. If radio options are ordered, another length of din rail is provided to mount the radio and the radio power supply. Module covers are automatically included with ATEX models F5209A and F0026A, so VA00147AA should not be ordered with these models. For the F0016A and F0043A models, the VA00147AA option will provide the correct amount of and type of covers based on the I/O options ordered.

Description Nomenclature

ADD: WALL MOUNT INSTALLATION KIT
VA00148AA

ADD: FRONT CABLE COVERS
VA00147AA

I/O Modules – I/O module options are available for all models except the FEP (F0043A). Up to two total models may be ordered (2 of a kind or 1 of each). When ordering the DI/AI module, a second option must be ordered to specify the voltage/current spec of the module. For example, to order one DI/AI 0-5V module and one DI/AI 0-20mA module, Qty 2 VA00150AA, Qty 1 VA00151AA, and Qty 1 VA00152AA would be ordered. To order 2 DI/AI 0-20mA modules, Qty 2 VA00150AA and Qty 2 VA00152AA would be ordered. The total quantity of options VA00151AA and VA00152AA must always equal the quantity of VA00150AA.

Description Nomenclature

ADD: 12DI/8AI HW ONLY NO LIC
VA00150AA

ADD: 8DO/2AO HW ONLY NO LIC
VA00149AA

Description Nomenclature

ADD: 0 - 5V DI/AI
VA00151AA

ADD: 0 - 20MA DI/AI
VA00152AA

ACE1000 Module - ACE1100 can be ordered in two different configurations

- FEP to support ACE1000 RTU – FEP built in application

- IRM Server – support up to 24 connection of IRM remote unit to the control center

ACE 1100 - FEP MODULE

ADD: ACE1000 FEP OPERATION
VA00154AA

ADD: 2XRS-232 PORT / AUX PLUG-IN BOARD
VA00006AA

ADD: MICROHARD N920 PLUG-IN BOARD
VA00144AA

ACE 1100 – IRM SERVER

ADD: ACE1000 IRM SERVER OPERATION
VA00189AA

ADD: WALL MOUNT INSTALLATION KIT
VA00148AA

ADD: FRONT CABLE COVERS
VA00147AA

Power Supply Cable – A DC Power Cable should order to connect to a 12V DC supply. The cable is fused. AC/DC power supplies are not orderable as options at this time. There are two commercially available din rail mount AC/DC power supplies that have been certified to work with ACE 1000:

1. Manufacturer: TDK LAMBDA , PN DPP120-12-1. It is available at www.newark.com, PN 66M7752.
2. Manufacturer: ARTESYN EMBEDDED TECHNOLOGIES , PN ADN5-24-1PM-C. It is available at www.digikey.com, PN 454-1368-ND.

Description Nomenclature

ADD: AC POWER SUPPLY 12V/120W DC OUT
VA00009AA

ADD: AC POWER SUPPLY 24V / 120W DC OUTPUT (LIMITED TEMP. -25 - +70)
VA00130AA

ADD:DC POWER CABLE
VA00155AA

Radios – to order a radio, two items must be ordered – the system type (TRBO, ASTRO 25, Dimetra), and the equipment type (mobile, portable, frequency band). The installation kit is included with the radio. The radio power supply is NOT included, and must be ordered separately.

Radio System Options (Available in North America region only)

Description Nomenclature

ADD: MOTOTRBO DIGITAL CONVENTIONAL
VA00159AA

ADD: MOTOTRBO CONNECT PLUS TRUNKING
VA00195AA

ADD: ASTRO 25 DIGITAL TRUNKING
VA00196AA

ADD: ASTRO 25 DIGITAL CONVENTIONAL
VA00197AA

Description Nomenclature

ADD: VHF MOBILE RADIO
VA00160AA

ADD: UHF R1 MOBILE RADIO
VA00161AA

ADD: UHF R2 MOBILE RADIO
VA00162AA

ADD: 700/800MHZ MOBILE RADIO (ASTRO P25 Only)
VA00201AA

ADD: 800/900MHZ MOBILE RADIO (MOTOTRBO Only)
VA00202AA

Installation kits

ADD: APX6500 DIGITAL ACE 1000 INSTALLATION KIT
VA00588AA

ADD: XPR 5000 DIGITAL ACE 1000 INSTALLATION KIT
VA00590AA

ADD: XPR 5000 CONNECT PLUS ACE 1000 INSTALLATION KIT
VA00592AA

Software

The standard software supports easy programming tool, “c” toolkit and MODBUS slave connection from the FEP to the SCADA. To enhance your software features you can order the following options:

ADD: CODESYS IEC 61131 LICENSE

VA00595AA

ADD: DNP3 MASTER LICENSE

VA00593AA

ADD: DNP3 SLAVE LICENSE

VA00594AA

Accessories - there is one accessory available with the model – an extractor tool for easy and safe removal of the screw terminal connectors from the CPU and I/O modules.

Description Nomenclature

ADD: I/O MODULE EXTRACTOR TOOL

VA00153AA

5.3

Field Replacement Units (FRUs)

There is a full list of FRUs that can be ordered as standalone.

RS-232 DATA CABLE

FKN0022

TERMINAL BLOCK CONNECTOR EXTRACTOR

FKN0024

RS-485 PORT 120 OHM TERMINATION CABLE

FKN0030

DC POWER CABLE

FKN0033

2XRS-232 PORT / AUX POWER PLUG-IN BOARD

FLN0048

2XRS-232 PORT PLUG-IN BOARD ATEX

FLN0049

ACE1000 MICROHARD N920 PLUG-IN BOARD

FLN0109

12DI/8AI MODULE +/- 20MA

FLN0050

12DI/8AI MODULE +/- 5V

FLN0051

8DO/2AO MODULE +/- 20MA, 5V

FLN0052

12DI/8AI MODULE +/- 20MA ATEX

FLN0053

12DI/8AI MODULE +/- 5V ATEX

FLN0054

8DO/2AO MODULE +/- 20MA/5V ATEX

FLN0055

GROUND CABLE

FKN0034

APX6500 INSTALLATION KIT

FLN0100

XPR5350 INSTALLATION KIT

FLN0093

XPR5350/80 CONNECT PLUS INSTALLATION KIT FOR ACE1000

FLN0115A

MTM5200 INSTALLATION KIT

FLN0043

APX4000 INSTALLATION KIT

FLN0042

MOTOTRBO XPR PORTABLE INSTALLATION KIT

FLN9996

XPR 5350 USB CABLE

FKN0026

DATA CABLE FOR CONNECT PLUS

FKN0040A

MTM5200 DATA CABLE

FKN0027

ACE1000 CABLE,BATTERY ELIMINATOR POWER

FKN8802A

RJ45 TO RJ45 EXTENSION CABLE 1500MM

FKN8803A

DC Y-CABLE FOR GPN6145 POWER SUPPLY

FKN8804A

DIN RAIL 26 CM

FHN0054

DIN RAIL 45 CM

FHN0056

DIN RAIL STOPPER

FHN0057

CPU PANEL COVER

FHN0058

I/O MODULE CONNECTOR COVER

FHN0059

SD COVER

FHN0060

TERMINAL BLOCK MALE 10 PIN 5MM

FHN0061

TERMINAL BLOCK MALE 3 PIN 5 MM

FHN0062

TERMINAL BLOCK MALE 2 PIN 5 MM

FHN0063

TERMINAL BLOCK MALE 4 PIN 3.5MM

FHN0064

RJ50 I/O MODULE CABLE

FHN0065

MOBILE RADIO DC CABLE 10FT

FKN0036

GPN6145 INSTALLATION KIT

FLN0095

AC POWER SUPPLY 12V/120W DC OUT

FLN0096

AC POWER SUPPLY 24V/120W DC OUT

FLN0101

APX 3000/4000 BATTERY ELIMINATOR BOARD

FLN1058

XPR5350 136-174 MHZ, DIGITAL + ANALOG + CONNECT PLUS

FUD1040A

XPR5350 403-470 MHZ, DIGITAL +ANALOG + CONNECT PLUS

FUE1078A

XPR5350 450-512 MHZ, DIGITAL + ANALOG + CONNECT PLUS

FUE1077A

XPR5380 800-900 MHZ, DIGITAL + ANALOG + CONNECT PLUS

FUF1200A

APX6500 136-174 MHZ (A+D)

FUD1041A

APX6500 380-470 MHZ (A+D)

FUE1250A

APX6500 450-520MHZ (A+D)

FUE1251A

APX6500 700/800 MHZ (A+D)

FUF1201A

Chapter 6

ACE1000-IRM Ordering Guide

ACE1000-IRM model is F0024A. It includes the rail mount enclosure with the main CPU board, and the DIN rail mount kit.

6.1

Option Selection

System and Frequency Band – The radio component of the IRM 1500 must be selected. Only one System and Frequency Band option can be selected. Currently, support system and frequency options include ASTRO 25 IV&D Trunking in 800MHz and 900MHz bands.

ADD: ASTRO 800 MHZ SUPPORT

VA00181AA

ADD: ASTRO 900 MHZ SUPPORT

VA00182AA

Option Board – The option board adds two additional RS232 ports to the IRM 1500. If this option is not selected, the cover for the option board is automatically provided.

ADD: 2X RS-232 PLUG-IN BOARD

VA00037AA

DIN Rail Installation Kit

ADD: WALL MOUNT INSTALLATION KIT

VA00148AA

Power Supply Cable – A DC Power Cable should be ordered to connect to a 12V DC supply. The cable is fused.

ADD:DC POWER CABLE

VA00155AA

AC/DC power supplies:

AC POWER SUPPLY 12V/120W DC OUT

FLN0096A

AC POWER SUPPLY 24V/120W DC OUT

FLN0101A

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