

Open Antenna-Modem Interface Protocol (AMIP) Implementation

Technical Note

January 13, 2014



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B	November 16, 2009	Added configuration information for iBuilder and OpenAMIP message mapping.	EHoffman/SWasser
C	July 21, 2010	Added legal language.	EHoffman/SWasser
D	January 13, 2014	Removed incorrect statement that K command must be followed by an F command.	JVespoli



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About This Guide

Purpose

This Technical Note describes the implementation of the Open Antenna-Modem Interface Protocol (OpenAMIP) on iDirect systems. [Appendix A](#) contains the OpenAMIP specification.

Intended Audience

This Technical Note is intended for network designers, system architects and antenna manufacturers interested in integrating the OpenAMIP interface with iDirect systems. This document can also be used by iDirect operators implementing OpenAMIP on iDirect networks.

Contents Of This Guide

This document contains the following chapters and appendixes:

- [Implementation](#)
- [OpenAMIP Specification \(Version 1.6\)](#)

Getting Help

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1 Implementation

OpenAMIP is defined by enumerating a set of messages along with a number of accompanying parameters for each message. This chapter discusses how the OpenAMIP interface is implemented on iDirect systems.

The iDirect OpenAMIP implementation varies depending on the iDirect iDS/iDX software version that you are configuring to use this protocol. See the *iBuilder User Guide* for the iDS/iDX version you are using. Also see the *Technical Reference Guide* for more information on OpenAMIP and Automatic Beam Switching (ABS) within iDirect systems.

Note: *Please see Appendix A for a published presentation of the latest OpenAMIP interface specification.*

Depending on the iDirect software release, OpenAMIP message parameters are configured using two methods:

- iDS 8.3.1
Manually enter specific OpenAMIP keys into the iBuilder Custom tab for each component you are configuring. Upon applying changes, the key values are inserted as OpenAMIP parameters into the Options files for the various iDirect components being configured.
- iDX 2.0.x and iDX 1.1
Configure OpenAMIP parameters by setting fields in the iBuilder VSAT tab for each component being configured. Upon applying changes, the field values are inserted as OpenAMIP parameters into the Options files for the various iDirect components being configured.

Note: *Regarding quad-band LNB implementations: Since the OpenAMIP specifies LNB LO frequency per beam, there is no need within the protocol to specify a combination of voltage/tone indication such as antenna controllers sometimes require for multi-band operation. It is up to the antenna controller vendor to take the LNB information and use it to set the LNB LO frequency as required.*

1.1 OpenAMIP Message to Option File Key Mapping

Within iDirect systems, the OpenAMIP message values are defined as keys in the Options file for the remote. [Table 1](#) defines how the OpenAMIP messages parameter values are mapped to their respective Options file keys. Please see [Table A-2](#) on page 19 for more detailed definitions of messages.

Table 1. OpenAMIP Message Command to Options File Key Mapping

iDS/iDX Release	Messages Sent from Remote		Mapped to Options File Keys	Options File Group	Messages Sent from Antenna	
	Message	# Parameters			Message	# Parameters
iDX 2.0.x	A		keepalive_interval Default value of 15 seconds. Will not appear in Options file unless overwritten.	[ANTENNA]	a	
	B	2	rx_lcl_osc, tx_lcl_osc	[SATELLITE]		
	H	2	hunt_frequency, hunt_bandwidth	[SATELLITE]		
	K	1	max_skew Maximum skew of the beam short axis to the geosynchronous arc.	[SATELLITE]		
	P	2	polarity, tx_polarity	[SATELLITE]		
	S	3	longitude, max_lat, pol_skew	[SATELLITE]	s	2
	T	2	tx_frequency, tx_bandwidth	[SATELLITE]		
	W	1	latlong_interval Message contains single value in seconds. Does not generate Options file key.	[MOBILE]	w	4
	X		extras Optional message conveying configured string containing "extras." Can only be set as Custom key.	[SATELLITE]		
iDS 8.3.1 & iDX 1.1	A		keepalive_interval Default value of 15 seconds. Will not appear in Options file unless overwritten.	[ANTENNA]	a	
	H	1	hunt_frequency	[SATELLITE]		
	P	1	polarity	[SATELLITE]		
	S	1	longitude	[SATELLITE]	s	2
	W		latlong_interval Message contains single value in seconds. Does not generate Options file key.	[MOBILE]	w	4

NOTE: The following messages are not reflected by keys in the Options file (or by fields in the iBuilder configuration tabs):

- The F message is an empty message (without parameters).
- The L message represents real time status only.
- The E and I messages are in the specification but not implemented.

Note: In iDX 2.0.x and iDX 1.1, the keys as they appear in the Options file are for reference only since they are configured in iBuilder.

The OpenAMIP interface is designed to be forward and backward compatible. This means that any subset of OpenAMIP messages and parameters from the specification can be used to implement the interface, with the meanings for the same message values in different implementations always remaining the same.

For example, the S message as defined in iDS 8.3.x system contains one parameter (`longitude`) only. The definition of the S message `longitude` parameter is the same in the OpenAMIP 1.6 specification. The additional two parameters for the S message (as defined in OpenAMIP 1.6) are simply ignored when using this message in iDS 8.3.x.

See [Section A.2, OpenAMIP Messages](#) for further information.

1.2 Sample Options File

This section presents a portion of a sample iDX 2.0.x Options file with OpenAMIP messages and parameters defined. OpenAMIP keys appear highlighted in blue.

```
[OPTIONS_FILE]
    product_mode = idirect_scpc
    modem_sn = 40170
    generated_by = NMS-10.0.0
    did = 12885226
    modem_type = Remote
    modem_hardware = 8350
    is_mesh = 0
    disable_options_flash_command = 0
    carrier_type = 0
    ...

[MOBILE]
    is_mobile = 1
    tx_handshake_enabled = 0
    gps_input = 2
    latlong_interval = 300
    latlong_fail_interval = 10
    init_tx_power_offset = 0.000000

[MAPSERVER_0]
    hostname = 172.20.130.3
    port = 5003

[BEAMS]
    beam_21 = PPS_Perf_Eval
    maxbeam = 21

[ANTENNA]
    manufacturer = OpenAMIP
    model = OpenAMIP
    addr = 172.26.81.34
    port = 5002
    connect_timeout = 30
```

```
dedicated_interface = ixp1
[SATELLITE]
min_look_angle = 0.000000
tx_frequency = 1200.000000
tx_bandwidth = 36.000000
hunt_bandwidth = 36.000000
rx_lcl_osc = 1450.000000
tx_lcl_osc = 1350.000000
max_skew = 90.000000
name = Bench Test Spacecraft (I/F)
channelname = PPS_Perf_Eval
longitude = 0.000000
max_lat = 0.000000
pol_skew = 0.000000
hunt_frequency = 1075.000000
polarity = H
tx_polarity = H
noise_reference_frequency = 0.000000
```

OpenAMIP keys are defined under the [SATELLITE] group. In the sample Options file, the tx_frequency and tx_bandwidth keys are defining both OpenAMIP parameter values (1200.000000 and 36.000000, respectively) for the T message. While the max_skew key is defining the single parameter value (90.000000) for the K OpenAMIP message.

1.3 iBuilder Configuration

This section presents an example of configuring OpenAMIP in the iDX 2.0 iBuilder client application. iDX 1.1 software also provides some of the same configuration options in iBuilder, while all versions of iDS/iDX that support OpenAMIP also support the key implementation described in [Section 1.1, OpenAMIP Message to Option File Key Mapping](#).

Note: As noted in [Table 1](#), some OpenAMIP parameters can only be configured as custom keys.

To configure remote OpenAMIP parameters in iBuilder:

1. When you configure your remote for OpenAMIP, you must first configure a Reflector in iBuilder:

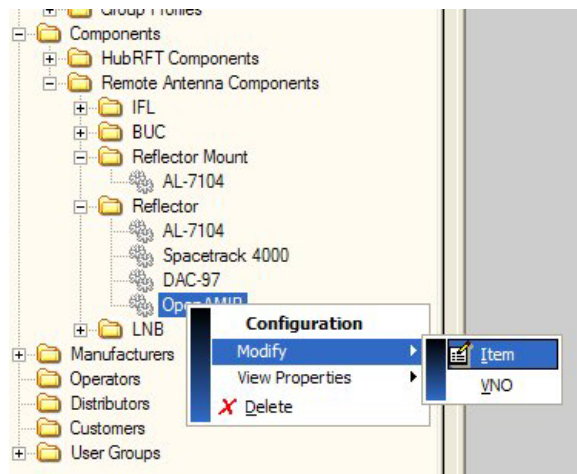


Figure 1. Opening Reflector Configuration Window

- a. Open the Reflector configuration window as shown in [Figure 1](#).

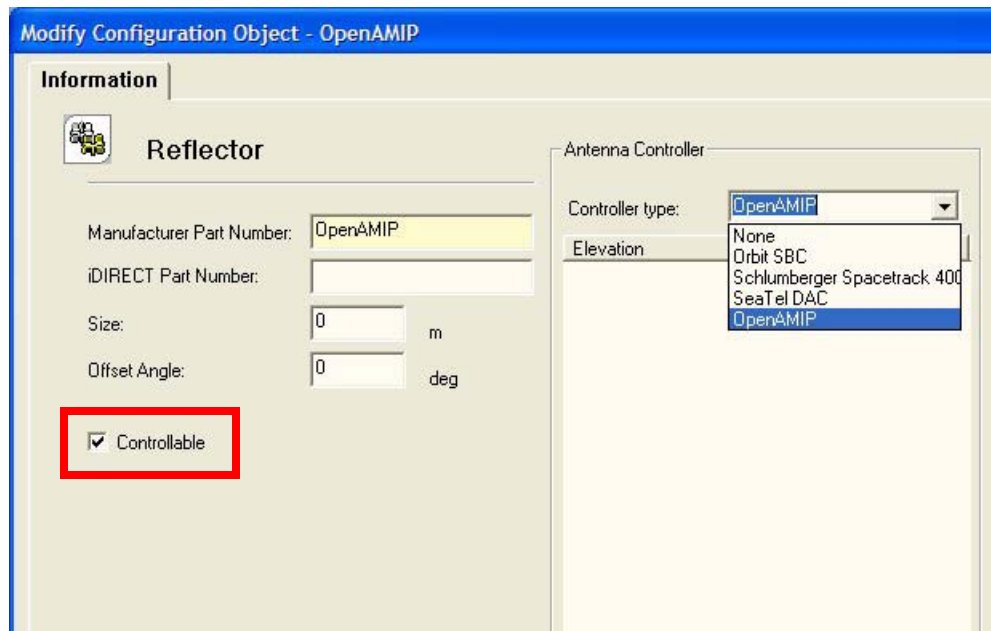


Figure 2. Information Tab for Reflector

- b. On the Information tab, first click the Controllable check box (Figure 2).

CAUTION: You must check the Controllable field before you can configure this component for other OpenAMIP field selections described later in this example.

- c. In the Controller type field, select OpenAMIP or another supported controller type. You can configure your ABS networks for any of the supported controller types or for use with OpenAMIP.
 - d. Click OK to save the Reflector configuration.
2. Now configure your remote for OpenAMIP:
 - a. Select **Modify**→**Item** for the remote you are configuring.
 - b. Click the **VSAT** tab in the Modify Configuration Object window (Figure 3).

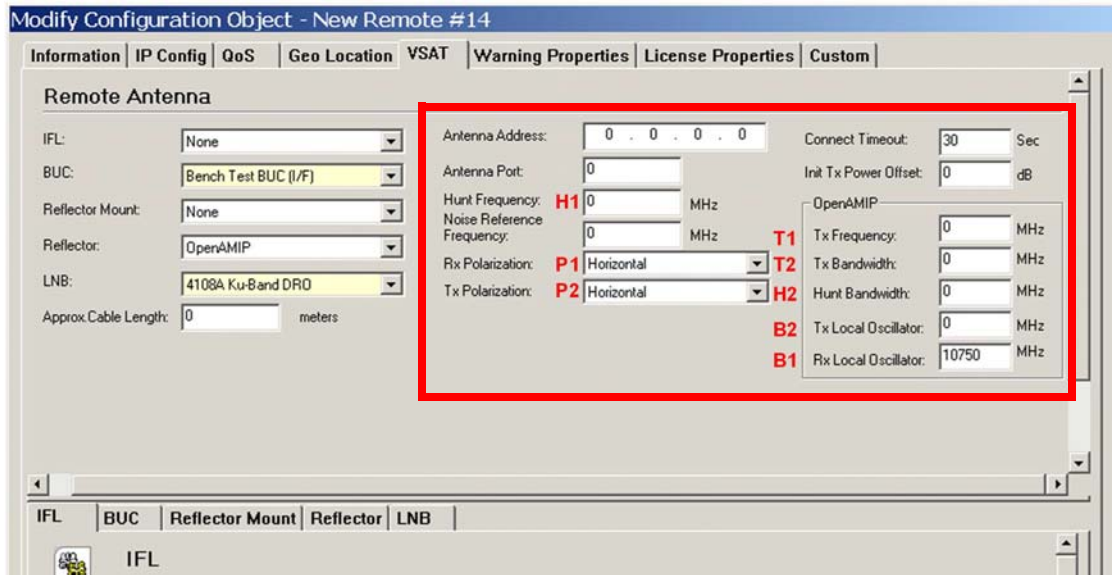


Figure 3. VSAT Tab with OpenAMIP Parameters

- c. Select **OpenAMIP** in the Reflector field.

Selecting **OpenAMIP** in the Reflector field displays the additional OpenAMIP fields on the right of the **Remote Antenna** pane (Figure 3). If selecting another reflector type, it must also be configured for OpenAMIP. Reflectors for all supported controllable antennas are pre-defined in the iBuilder database.

Note: The Reflector Mount field is used for reference only. It can be configured as OpenAMIP Manufacturer.

In Figure 3 the corresponding OpenAMIP messages (and parameter number) defined in Table 1 are marked in red letters to the left of the corresponding field selections.

3. Additional OpenAMIP parameters are configured on the Spacecraft Information tab as shown in Figure 4.

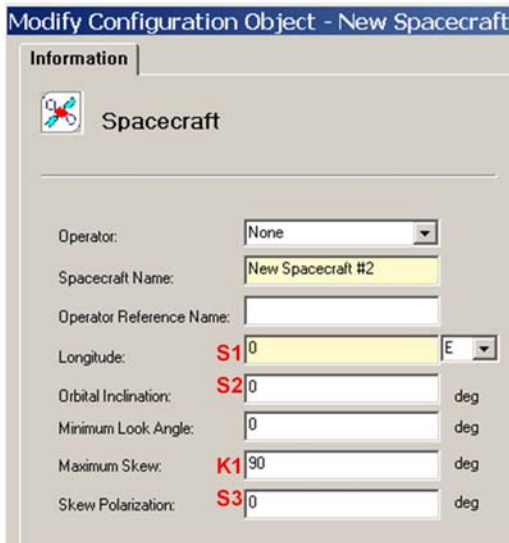


Figure 4. Spacecraft Information Tab

In Figure 4 the corresponding OpenAMIP messages (and parameter number) defined in Table 1 are marked in red letters to the left of the corresponding field selections.

4. The K message (max_skew) is configured from the Spacecraft Information tab (Figure 4), but can be overridden for each remote:
 - a. Select the Geo Location tab on the Modify Configuration Object window for the remote (Figure 5).



Figure 5. Geo Location Tab—Overriding Maximum Skew

- b. Click the Override button in the Maximum Skew area, and enter a value in degrees.

Note: For stabilized antennas, the GPS location input should be configured for "Antenna" as indicated in Figure 5.

See the *iBuilder User Guide* for additional information on the configuration windows described in this section.

Appendix A OpenAMIP Specification (Version 1.6)

This appendix publishes Version 1.6 of the OpenAMIP specification.

- [Overview](#)
- [OpenAMIP Messages](#)
- [Semantics](#)
- [Formal Syntax](#)
- [Transport Protocols](#)
- [Design References](#)

A.1 Overview

This section introduces the OpenAMIP protocol. The protocol is defined and legal and design issues are discussed.

A.1.1 What Is OpenAMIP?

OpenAMIP is an ASCII message-based protocol, a specification for the interchange of information between an antenna controller and a satellite modem. It allows the modem to command the controller to seek a particular satellite and allows the modem and controller to exchange information necessary to permit the modem to initiate and maintain communications through the antenna and the satellite.

OpenAMIP is intended to be simple and flexible. Communications are in the form messages of human-readable ASCII characters. Infrequent message flows, and the fact that messaging is confined to high-bandwidth LANs (and not satellite links) mitigates the relative inefficiency of using human-readable text.

The messages may be conveyed using any of several lower-level protocols including:

- HTTP
- TCP/IP over a LAN
- UDP over a LAN
- High-speed serial connection

OpenAMIP is intended only for the purpose of permitting a modem and a controller to perform synchronized automatic beam selection. It is not a status logging system or a diagnostic

system. The modem and the controller are free to implement independent monitoring and control using proprietary techniques or open standards (such as SNMP or syslog).

There is no explicit provision in this OpenAMIP protocol for security or validation. The controller and the modem can choose to use any of several security measures at lower protocol layers.

A message consists of one or more space-separated variable-length fields. The command is terminated by a new line `<lf>` character or by the `<cr><lf>` sequence.

The first field is a message type. Each type of message requires a specific number of parameters. The last parameter can optionally be separated from the new line character by a comment that begins with a `#` character. The `#` can be followed by a string containing any characters (other than a new line character).

Note: Implementations of the receive-side of the protocol must be designed to detect and ignore comments delineated with the # character.

A.1.2 OpenAMIP Design

The modem implements the protocol as described in this section.

Connecting with Antenna

The modem establishes a connection with an antenna as follows:

1. The modem reads the antenna IP address and TCP port number from a configuration file.
2. The modem attempts to connect to the antenna through TCP. If the connection fails, the modem attempts to re-establish it.
3. Whenever the modem succeeds in connecting to the antenna, it sends a set of setup commands. These commands are sent back-to-back with no intervening commands and without waiting for responses.

The commands are `S`, `H`, `P`, `B`, `X`, `A`, `F`, `W`, and `L`.

Communicating with Antenna

The modem then waits for messages from the antenna. The modem sends an `L` message whenever the lock state changes. If the modem receives an `a` message, it also sends an `L` message periodically. The modem reacts internally to received `s` and `w` messages, which it expects to see periodically based on its `A` and `W` timers. If the modem fails to see an `s` or a `w` message when expected, it clears the TCP connection and attempts to re-establish it; and the cycle repeats.

If the modem decides to switch to a different satellite, it sends the setup sequence again.

A.1.3 Legal Matters

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The protocol was invented and developed by iDirect Technologies.

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A.1.4 Certification

You may certify compliance of your interface with the test suite yourself, provided that you ensure that the product accurately reflects the terms of this document. If you do, you are free to use the trademark OpenAMIP™ solely for any product that you have properly certified. Alternatively, iDirect and other OpenAMIP implementers have certification programs and will certify your interface for a fee.

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A.2 OpenAMIP Messages

This section defines all message types generated by the OpenAMIP protocol. The formal syntax and semantics are described in later sections.

A.2.1 Standard Message Types

The standard message set is comprised of the entire minimal set of functionality required for OpenAMIP protocol operation. Sample messages in various scenarios are shown to illustrate the purpose and usage of each message.

Satellite Description Messages

Scenario 1: The modem must be able to convey all of the information needed by the controller to describe a satellite. These messages must be sufficient for the controller to identify the satellite and to command the controller to find the satellite.

Table A-1 presents the satellite description parameters.

Table A-1 Satellite Description Parameters

Message Type	Message Syntax and Description
S	Satellite longitude [contains 3 parameters in degrees (all floating point values)] For example: S -20.1 1.0 3.5 where: Negative values indicate west (i.e., -20.1) wander in latitude = 1.0 Pol skew = 3.5
P	Polarization [contains 2 parameters. Parameters can be H, V, L or R for Rx and Tx] For example: P L R
H	Hunt frequency [contains 2 parameters: center frequency and bandwidth in Mhz (both floating point values)] For example: H 1123.321 0.256
B	Local oscillator Rx down-conversion and Tx up-conversion frequency offsets [contains 2 parameters: frequencies in Mhz (floating point values)] For example: B 10750.0 13050.0

Table A-1 Satellite Description Parameters

Message Type	Message Syntax and Description
X	Unformatted string used by the antenna controller For example: X nid=1234
F	Find [Use the recent S, P, R and H parameters] For example: F

Modem & Controller Status Messages

Scenario 2: The modem expects to receive keepalive messages. This is a simple mechanism to ensure that communications connectivity with the controller has not been lost.

“Keep alive” (A) timing interval message (to controller)
[contains single parameter of n seconds]

A n

where:

n = number of seconds until antenna controller resends status

For example:

A 10

Scenario 3: The modem must be able to inform the controller when the modem has detected the downstream carrier:

“Modem lock status” (L) message
[contains single yes/no parameter n]

L n

where:

$n = 1$ is locked, and $n = 0$ is unlocked

For example:

L 1

Scenario 4: The controller must be able to tell the modem its status: when it is locked onto the satellite, when it is functional, and when it is unblocked:

“Controller status” (s) message
[contains 2 yes/no parameters: “functional” and “OK to transmit”]

s l m

where:

l = yes/no parameter (“1” functional, “0” not functional)

m = yes/no parameter (“1” OK to transmit, “0” not OK to transmit)

For example:

s 1 1

Scenario 5: The modem must be able to request periodic location information:

“Location query” (w) message
[contains single parameter of n seconds]

w n

where:

n = number of seconds between location updates from controller

For example:

w 60

Scenario 6: The controller must be able to send GPS information to the modem:

“Location information” (w) message
[contains 4 parameters: valid, lat, lon and time]

w o p q r

where:

o = valid (=1) or invalid (=0)

p = latitude in degrees (floating point number, south is negative)

q = longitude in degrees (floating point number, west is negative)

r = GPS time in seconds (if the antenna does not have GPS time, set this to zero)

For example:

w 1 -10.123 20.235 123456789

A.2.2 Additional Message Types

In addition to the standard message types, OpenAMIP also supports several other message types as described in this section.

Equipment Identification Messages

The messages in this section transmit equipment identification information between modems and controllers.

Modem Identification

This message identifies the modem manufacturer and equipment model from the modem to the controller.

“modem identification” (I) message
[contains 2 string parameters: manufacturer and model (no spaces in the strings)]

I s t

where:

s = modem manufacturer

t = modem model

For example:

I iDirect 5100

Controller Identification

This message identifies the controller manufacturer and equipment model from the controller to the modem.

“controller identification” (i) message

[contains 2 string parameters: manufacturer and model (no spaces in the strings)]

I u v

where:

u = controller manufacturer

v = controller model

For example:

i YoyoDyne 1234

Keepalive Timing Interval Message

The controller can send a request for keepalive interval to the modem.

“Keep alive” (A) timing interval message (to modem)

[contains single parameter of *n* seconds]

A n

where:

n = number of seconds between keepalives from the modem

For example:

A 60

Extended Type Messages

Any antenna or modem manufacturer can extend the protocol by creating an extended type field, which consists of the manufacturer's name (with no spaces) followed by a colon, followed by a type (with no spaces). If a modem receives a message of unknown type, the modem ignores the message.

If an antenna controller receives a message of unknown type, the controller ignores the message. If the messages are optional for operation of the equipment, then the protocol still qualifies as unmodified OpenAMIP. If the messages must be used for a particular antenna or modem, then the resulting implementation must be called modified OpenAMIP.

For example:

Yoyodyne:NID 1132

Additional search parameter for satellite identification from modem to the Yoyodyne antenna.

iDirect::stow 1

Command specified by iDirect, command from modem to the antenna to direct it to stow itself.

A.2.3 Backward Compatibility

There is also a requirement that newer versions of the protocol be backward compatible with older versions. OpenAMIP accommodates this requirement by requiring that the meanings of parameters never change from version to version. New parameters can be added to a message, and new messages can be added.

The receiver, however, is required to ignore extra parameters and unknown messages, allowing an older version of the protocol running on a receiver to work with a newer sender. OpenAMIP also requires the receiver to operate properly when it receives a message that does not have enough parameters: this allows a newer receiver version to work with an older sender. The older version will not implement functionality that requires the newer version. However, the older version will continue to provide the functionality of the older version when operating with a partner that is using a newer version.

A.3 Semantics

The OpenAMIP protocol is a peer protocol: Neither side is the master. The protocol is primarily intended to convey state change information based on external events. To comply with certain regulatory constraints, the modem must disable its transmitter within 100ms from when the antenna loses lock on a satellite, and must also disable the transmitter immediately when a blockage occurs. Therefore, the antenna minimizes the interval between detecting a change in condition and sending the status message to the modem. The antenna can choose to use the modem lock signal as part of its satellite search, and as a result, the modem minimizes the interval between detecting the condition and sending the message to the controller. Status changes are reported within 10ms. This is not practical on slow serial links, as it results in deprecating such links.

A.3.1 Communication Between Modem and Controller

Prior to any communication between the modem and the controller, the OpenAMIP state is unspecified. The modem initiates communications by sending the commands needed to deliver the satellite parameters to the controller. It then sends a Find (F) message.

When the controller receives a Find (F) message, it responds immediately with a Controller status (s) message. The controller also sends a status every keepalive interval each time the status changes. When the controller responds to an F message, the locked status must reflect the status with respect to the newly-selected satellite parameters. This means that if the modem has just commanded the antenna to Find the satellite that it is already tracking and is already locked on, then the immediate status is locked.

However, if the antenna is already tracking a satellite and is successfully locked to it, and the modem then sends new parameters and issues a new Find command, the controller must send a status of unlocked because it is not locked to the new satellite (it is locked to the old satellite). After the antenna locks to the new satellite, it sends a new status message indicating that it is locked.

The modem sends a L 0 or L 1 whenever the modem lock changes. It also sends the locked status each time its keepalive timer expires.

When the modem issues a Location query (w) message the controller immediately responds with a Location information (w) message. The controller responds thereafter every w seconds (zero seconds means never.) If the controller sends a w to the modem that indicates that the

location information is invalid, then the controller sends a new `w` message immediately when it receives valid location information.

A.3.2 Latitude & Longitude Reporting

Latitude and longitude are reported in floating point decimal degrees. The range for latitude is -90.0 to 90.0, where -90.0 is the south pole. The range for longitude is -360.0 to 360.0, where negative is west from the prime meridian and positive is east from the prime meridian. The overlap is intentional, since the sender is free to use 0 to 360 or -180 to 180 (or even -360 to 0 or a mixed system.) The receiver must be able to handle the full -360 to 360 range. Leading zeros are optional for the sender, except that the number must have at least one digit before the decimal point. Trailing zeros are optional for the sender, except that the number must have at least one digit after the decimal. The receiver must be able to handle leading and trailing zeros correctly. If the fractional part is zero, the number can be specified as an integer (i.e., without a decimal point). Note that the syntax does not permit the use of the `+` character.

The precision of the latitude and longitude is not specified by the OpenAMIP syntax, since the number of digits after the decimal point is arbitrary. However, the sender should provide as much precision as is actually available. OpenAMIP allows the ability to use this information for logging and transmission restrictions as mandated by regulatory authorities, so accuracy to one kilometer is necessary, implying that latitudes and longitudes to a precision of thousandths of a degree are needed.

A.3.3 Status Messages

If the modem issues a `P`, `B`, or `F` command that is incompatible with the antenna hardware, the antenna can either ignore the incompatible parts of the command or may set the functional status to “not functional.”

K Message Usage

The `K` message conveys the maximum skew of the short axis of a non-circular beam to the geosynchronous arc. If the antenna has a beam shape that is radially symmetric about the bore sight, this parameter can be ignored. Otherwise, the antenna must use the current skew as a factor in computing the “must not transmit” or “may transmit status.” When all other factors permit transmission, the antenna immediately sends a status message with a status of “must not transmit” when the angle transitions from below to above the maximum skew. Likewise, the antenna immediately sends a status message with a status of “may transmit” when the angle transitions from above to below the maximum skew. In contrast to some other messages, the `K` message takes affect immediately and the modem can send a new `K` message with a new max skew angle at any time.

Antenna Functional Status Message

The functional status from the antenna indicates that the antenna is currently working. By contrast, non-functional means that the antenna is not currently expected to be in service. This does not include blockage, loss of lock, system initialization, loss of heading information, cable unwrap or any condition that can correct itself without intervention. It does include

detection of a fatal mechanical failure, or an operator command to the antenna controller from its front panel or other source, or an illegal configuration.

When the modem observes this status, it does not attempt to recover by (for example) switching to a different satellite or clearing and re-establishing the OpenAMIP connection. The modem waits until the antenna declares itself to be “functional.” The antenna asserts “may transmit” when it is locked on the satellite and there is no known reason that the modem should not transmit. The antenna signals “must not transmit” if there is any reason the modem should not transmit: blockage, loss of lock, cable unwrap, sea too rough.

A.3.4 Simulation and Validation

Implementers can validate their semantics by executing a script that emulates a controller or a modem. The scripts are written in POSIX-compliant C, and are available on request from iDirect.

A.4 Formal Syntax

This section contains the OpenAMIP formal syntax format. Both abstract and specific message formats are presented, along with some notes on OpenAMIP version compatibility.

A.4.1 Abstract Message

An abstract OpenAMIP message format is specified below in Backus-Naur Form (BNF):

```
<msg> ::= <msg_body><optional whitespace>'\n'
        | <msg_body><optional whitespace>'#'<comment_body>'\n'
<comment_body> ::= <non-newline>
                 | <non-newline><comment_body>
<non_newline> ::= {any printable character except '\n'}
<msg_body> ::= <msg_type>
               | <msg_type> <param_list>
<param_list> ::= <whitespace> <param>
                 | <param><param_list>
<param> ::= <binary>
            | <float>
            | <int>
            | <string>
<binary> ::= '1'
            | '0'
<int> ::= '-' <natural>
        | <natural>
<float> ::= <int>'.'<natural>
          | <int>
<natural> ::= <digit>
```

```

| <digit><natural>
<digit>::= '0'|'1'|'2'|'3'|'4'|'5'|'6'|'7'|'8'|'9'
<string> ::=<string_char>
|<string_char><string>
<string_char>::={any printable character except ' ' and '\n'}
<optional whitespace>::=NULL|<whitespace>
<whitespace>::=<whitespace_char>|<whitespace><whitespace_char>
<whitespace_char>::= '\t'|\r'

```

A.4.2 Specific Messages

Table A-2 catalogs all standard OpenAMIP message types.

Table A-2 Open AMIP Messages

Sender	Type	# Parms	Parameters	Semantics
Modem	A	1	int seconds	Keepalive time. Antenna should send a status message at least this often.
Modem	B	2	float RX lo frequency float TX lo frequency	local oscillator RX down-conversion frequency in MHz local oscillator TX up-conversion frequency in MHz
Modem	E	1	float max power	Maximum L-band TX power to be expected at the Antenna (in dBm)
Modem	F	0		Used for finding a satellite or sending a parameter. The antenna should now begin using the satellite specified by S, P, B, X and H.
Modem	H	1	float frequency float bandwidth	Hunt frequency in MHz. Modem expects antenna to use this hunt center frequency when commanded. Hunt bandwidth in MHz. Modem expects antenna to use this bandwidth for hunting when commanded.
Modem	I	2	string: modem manufacturer string: modem model	Optional
Modem	K	1	float degrees	Maximum skew of the beam short axis to the geosynchronous arc.

Table A-2 Open AMIP Messages

Sender	Type	# Parms	Parameters	Semantics
Modem	L	2	binary 1 (locked) or 0 (unlocked)	Modem is locked to downstream, or not. The modem should send this message immediately when the status changes. The modem should send this message periodically at intervals specified by the antenna in the a message.
			binary 1 (tx on) or 0 (tx off)	Modem is free to transmit, or not. This signal may be used by the antenna to remove power from the Tx amplifiers.
Modem	P	2	char L, R, V, or H	Modem expects antenna to use this Rx pol when commanded.
			char L, R, V, or H	Modem expects antenna to use this Tx pol when commanded.
Modem	S	3	float longitude (degrees)	Satellite longitude. Modem expects antenna to use this satellite when commanded.
			float latitude variance	Maximum excursion in satellite's latitude (for inclined-orbit satellites).
			float pol skew	Satellite's nominal polarization offset in degrees (for skewed satellites).
Modem	T	2	float Tx freq	Modem intends to transmit at this L-band frequency in MHz.
			float Tx bandwidth	Modem intends to use this range of frequencies in MHz.
Modem	W	1	int seconds	Location time. Antenna should send w message immediately, and then repeat at least this often. "0" means never repeat.
Modem	X	1	string	Extra hunt parameters. This is a fixed string to be configured by the operator and sent as part of the lookup. The antenna vendor specifies the string. If the controller does not need this command, the modem does not need to send it. However, the modem may send it anyway, in which case the controller will ignore it.
Antenna	a	1	int seconds	Keepalive time. Antenna expects to see an L message from the modem at least this often.
Antenna	i	2	string: manufacturer string: model	Optional.

Table A-2 Open AMIP Messages

Sender	Type	# Parms	Parameters	Semantics
Antenna	s	2	binary (1 or 0) antenna (is, is not) functional binary(1 or 0) modem (may, must not) transmit	<p>Antenna sends this immediately in response to the F command from the modem.</p> <p>Antenna sends this immediately whenever either of the two statuses changes.</p> <p>Antenna send this periodically. The period is set by the A command from the modem.</p> <ul style="list-style-type: none"> not functional means that the antenna cannot currently operate and will never operate with this configuration. This can be temporary (e.g., an illegal configuration) or permanent (e.g., motor frozen) modem must not transmit means that the antenna has detected a condition (loss of lock, blockage, cable unwrap, max skew exceeded) that does not require a reconfiguration, but that does require the modem to cease transmission.
Antenna	w	4	binary (1 or 0) location (is, is not) valid. float latitude (degrees) negative is south float longitude (degrees) negative is west of prime meridian int time (GPS seconds) time in seconds since the GPS epoch	<p>Antenna sends this to modem periodically. The period is set by the W command from the modem.</p> <p>If the location is not valid, the antenna may put the "0" character in the last three parameters. If the antenna does not know the time, the last parameter should be "0". The precision of the floating point numbers should reflect the precision of the location information. For example, OpenAMIP expects about 3 digits after the decimal point if the source is GPS. The antenna should send a w immediately if its internal GPS status changes from invalid to valid.</p>

A.4.3 OpenAMIP Version Compatibility

New versions of the OpenAMIP protocol may be published from time to time. New versions shall be strict supersets of older versions and can extend the protocol in only two ways:

- A new version may add new message types.
- A new version may add new parameters to the end of an existing message type.

No other syntactic extensions are acceptable. Any extension to the semantics of the protocol must not affect the semantics of earlier versions. The intent of this specification is that any older implementation of the protocol can interoperate with any newer implementation without loss of any of the older functionality. Therefore, a compliant implementation of OpenAMIP must ignore any message type that it receives, and must ignore any unexpected

parameters at the end of a message. Furthermore, a compliant implementation must operate successfully if it receives a message with too few parameters. Parameters that are added to the protocol in version 1.5 or later will have default values that the receiver shall use if a message does not provide the parameter.

A.5 Transport Protocols

This section discusses supported transport protocols and interfaces for OpenAMIP.

A.5.1 TCP Interface

A modem and controller can communicate using TCP. Either the modem or antenna controller can call the other. The method of discovering the IP address and TCP port is outside the scope of OpenAMIP. In the reference implementation (see [Section A.6, Design References](#)), the antenna listens on a configured TCP port and accepts calls from a configured range of modem IP addresses. The modem initiates a TCP connection to a configured antenna IP address and TCP port.

Whenever the TCP connection goes down, the antenna sets its keepalive and GPS time to infinity. When a new TCP connection is established, the antenna sends one keepalive to the modem, and the modem sends one keepalive to the antenna. The disconnect timer is set to 15 seconds on each side. If the disconnect timer expires, the TCP connection is terminated. The disconnect timer is set to 15 seconds whenever a keepalive message is received.

Neither the antenna nor the modem are required to accept more than one TCP connection at a time, even though multiple connections are allowed. In a system with two modems, one can function as a backup. In this arrangement, the antenna only honors satellite selection requests from one modem.

TCP is a stream-oriented protocol, meaning there is no particular mapping of an OpenAMIP message into an IP packet. A single packet can contain a fragment of a message, a complete message, or multiple messages. In the reference implementation (see [Section A.6, Design References](#)), the modem sends an entire initial set of seven messages in a single POSIX “write” command immediately after opening the connection. On most POSIX systems, this results in a single TCP/IP packet. The reference receiver implementation accumulates characters until a new line is found and then processes the result as an OpenAMIP message. Accumulation of the next message starts with the first character after the new line.

A.5.2 UDP Interface

Each message fits in a single UDP packet. This packet can contain more than one message, but any given message must be fully contained within one packet. The antenna has a configured IP address and well-known port, as does the modem. The initial state of the OpenAMIP interface is “idle” (i.e., no keepalive) until the partner sends a keepalive timer. The interface reverts to the idle state if three keepalives are missed.

A.5.3 Asynchronous Serial Interface

This is beyond the scope of OpenAMIP. However, SLIP can be used to establish an IP connection on the serial link. Alternatively, any packet-over-serial technique may be used. Please note that a checksum should be used in this situation.

A.6 Design References

A.6.1 Reference Implementations

iDirect provides reference implementations in C, and make no representations that these are actually suitable for use in a product.

A.6.2 Test Suite

Code for the test suite was developed from the reference implementation. It is available from iDirect.

A.6.3 Software Availability

The source code for the reference implementations and the test suite are copyrighted by iDirect but are licensed at no cost to use for any purpose.

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