### Appendix D

# iDirect Modem

Interface and Reference Guide Revision R11.10.0

Documentation of the interface between the iDirect modem and the AvL Technologies AAQ antenna controller, reference information, and troubleshooting guide.

> AvL Technologies 900-159-004



### **Revision History**

Date	Revision	Revision By	Approved By	<b>Revision Description</b>
4/29/2015	1.0	M.P.		Initial Release for R11.2
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### Contents

1

т.		
2.	Introduction	2
	Setup Guide	3
	2.1. Hardware	3
	2.2. Software	3
	2.3. Hardware Connection	3
3.	2.3.1. Serial Communication Connection	4
	2.3.2. Ethernet Communication Connection	4
	Configuration	5
	3.1. Core Configuration Items	5
	3.1.1. Ethernet Setup	6
	3.1.2. Serial Setup	7
	3.1.3. iDirect Specific Configuration	7
	3.2. Target Configuration Items	8

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3.3. Signal Configuration Items	10
3.4. Feed Configuration Items	12
Functional Overview	12
4.1. Acquisition Process	13
4.2. Sensor Outputs	13
4.3. Module Window	14
4.3.1. Device Window	14
4.3.2. Device Control Window	15
Issues and Troubleshooting	15
	<ul> <li>3.3. Signal Configuration Items</li> <li>3.4. Feed Configuration Items</li> <li>Functional Overview</li> <li>4.1. Acquisition Process</li> <li>4.2. Sensor Outputs</li> <li>4.3. Module Window</li> <li>4.3.1. Device Window</li> <li>4.3.2. Device Control Window</li> <li>Issues and Troubleshooting</li> </ul>

#### 5.

### **Figures**

Figure 1 – Version Info	3
Figure 2 – Serial Setup	4
Figure 3 – Ethernet Setup	4
Figure 4 - AAQ Network Interface Option Window	5
Figure 5 - Core Configuration Window, System Configuration	6
Figure 6 - Core Configuration Window, Module Configuration	7
Figure 7 - Target Configuration	9
Figure 8 - Signal Configuration Window	10
Figure 9 - Acquire Command	13
Figure 10 – Sensor Output	14
Figure 11 – Device Window	15
	<ul> <li>Figure 1 – Version Info</li> <li>Figure 2 – Serial Setup</li> <li>Figure 3 – Ethernet Setup</li> <li>Figure 4 - AAQ Network Interface Option Window</li> <li>Figure 5 - Core Configuration Window, System Configuration</li> <li>Figure 6 - Core Configuration Window, Module Configuration</li> <li>Figure 7 - Target Configuration</li> <li>Figure 8 - Signal Configuration Window</li> <li>Figure 9 - Acquire Command</li> <li>Figure 10 – Sensor Output</li> <li>Figure 11 – Device Window</li> </ul>

### Introduction

This document describes the concepts required to use the iDirect module as part of the AAQ Controller. This module directly supports iDirect modems Evolution X3, X5, X7, and the Evolution 8000 Series. It is recommended that older iDirect modems should be upgraded to software version iDX 3.5.

iDirect Evolution modems are an IP-based satellite communications system engineered to deliver the highest quality broadband connectivity. The Platform is built on DVB-S2/ ACM with Adaptive TDMA and multiple technologies to allocate bandwidth efficiently over distributed networks, while automatically adjusting to dynamic traffic demands and changing network conditions.





### **Setup Guide**

#### 2.1. Hardware

- iDirect Modem
- 2.
- Evolution X3
- o Evolution X5
- Evolution X7
- o Evolution 8000 Series
- AvL AAQ Antenna System

#### 2.2. Software

Ensure that the Remote Client, ROM, and device module are at or above the versions shown in Figure 1:

AAQ Version Info.			
Filename	Туре	Version	Build
AAQRemote	Remote Client	R11.10	410
AAQ.rom	ROM File	R11.10.0.0	0
AAQ.conf	Config File	3341	
Azimuth RIOM	RIOM		444
Elevation RIOM	RIOM		444
Polarization RIOM	RIOM		432
Navigation RIOM	RIOM		454
Digital IO RIOM	RIOM		433
/home/root/HughesHN.D11.10.0-3.mod	Modem	D11.10.0.3	3
/home/root/GPSBroadcast.D11.10.0-2.mod	Utility	D11.10.0.2	2
/home/root/iDirect.R11.10.0-0.mod	Modem	R11.10.0.0	0
/home/root/RSL1.D11.10.0-3.mod	Modem	D11.10.0.3	3



Note: It is recommended that older iDirect modems should be upgraded to software version iDX 3.5.

#### 2.3. Hardware Connection

Connect the AAQ antenna controller to the iDirect modem through the desired means. The AAQ controller supports serial (RS232) and Ethernet communications to the iDirect modem and can be configured to use either depending on the necessary networking scheme.



#### 2.3.1. Serial Communication Connection

To communicate with the iDirect modem through a serial connection, connect the serial cable from the AAQ antenna system to the Console port on the modem. Connect power to all devices. Confirm that the serial port settings are correct per section 3 of this document.



Figure 2 – Serial Setup

#### 2.3.2. Ethernet Communication Connection

When setting the system to communicate by Ethernet, connect both the controller and the iDirect modem to the AvL CIP or other network switch so the controller can query the modem over the network. Ensure power is connected to each device. Confirm that the Ethernet settings are correct per section 3 of this document.



Figure 3 – Ethernet Setup



When setting the system to communicate by Ethernet, it is important to make sure the controller has a network path to the iDirect modem so the controller can query the modem over the network. The example shown below represents a typical installation.

Path									
Main Window	Main Window $\rightarrow$ File $\rightarrow$ Settings $\rightarrow$ AAQ Network Interface Options								
Level 1									
	M Advanced N	Network Settings		- 🗆 X					
	Customer Network 1		Customer Network 2	Service Network					
	IP Address :	172.27.169.2	10.20.20.26	192.168.129.51					
	Subnet : 255.255.255.0		255.255.255.0	255.255.255.0					
	Gateway :	192.168.129.2	192.168.129.1						
	Refresh	DHCP	Apply	Cancel					

Figure 4 - AAQ Network Interface Option Window

#### 3.

### Configuration

#### **3.1. Core Configuration Items**

Modify the following configuration items to enable interaction of the controller with the modem. These configuration items can be accessed using the AAQRemote GUI. The configuration varies depending upon the physical connection method (Ethernet or serial).





M Configuration –								
	Search Keyword: iDirect	Search	Clear					
Core Target Signal Feed								
Modules								
iDirect Console Password	iDirect 🔶							
iDirect Console Username	root 🔶							
iDirect Manual Offline	0							
iDirect Manual Online	0							
iDirect SNR Lock Threshold	100							
iDirect Socket Delay	100							
iDirect Telnet Command	telnet 0							
iDirect Telnet Password	P@55w0rd!							
iDirect Telnet Username	admin 🔶							
iDirect Use Automated TX Offline Logic	1							
□ System								
iDirect Com Port	216.25.237.89							
iDirect Com Port Settings	23							
Dimet SND Look Threshold								
iDirect SNR Lock Threshold	iDirect SNR Lock Threshold							
The SNR value that is necessary to delare lock Default [0]								
Upload Download	Undo Save		Close					

Figure 5 - Core Configuration Window, System Configuration

#### 3.1.1. Ethernet Setup

If configuring to communicate over Ethernet set the iDirect module to use the IP address and Port Number of the iDirect modem.

Long Name	Level	Туре	Value Range	Documentation
iDirect Com Port	4	String	iDirect IPv4 Address	The factory set IPv4 address of the iDirect modem
iDirect Com Port Settings	4	String	23	The standard Telnet Com Port





#### 3.1.2. Serial Setup

If configuring to communicate over Serial, set the iDirect module to use the RS 232 com port and Port Number of the iDirect modem.

Long Name	Level	Туре	Value Range	Documentation
iDirect Com Port	Δ	String	/dev/ttyO0 or	The computer device filename for the
IDirect Com Port	4	String	/dev/ttyO3	communications port used
	4	String	BaudRate,	The communications parameters for the comm
iDirect Com Port			DataBits,	port in the form of BaudRate, DataBits, StopBits,
Settings			Parity &	Parity (i.e. 9600 8 1 0) where parity values are 0
			StopBits	for none and 1 for even.

#### **3.1.3. iDirect Specific Configuration**

Path	
Main Window $\rightarrow$ View $\rightarrow$ Configuration $\rightarrow$ Core	
Level 4	

M Configuration			-		×		
	Search Keyword:	iDirect	Search	Cle	ear		
Core Target Signal Feed							
Modules							
iDirect Console Password	iDirec	zt					
iDirect Console Username	root						
iDirect Manual Offline	0						
iDirect Manual Online	0						
iDirect SNR Lock Threshold	100						
iDirect Socket Delay	100						
iDirect Telnet Command	telnet						
iDirect Telnet Password	P@5						
iDirect Telnet Username	admir						
iDirect Use Automated TX Offline Logic	1						
System							
iDirect Com Port	216.2	25.237.89					
iDirect Com Port Settings	23						
iDirect SNR Lock Threshold iDirect SNR Lock Threshold							
The SNR value that is necessary to delare lock Default 101							
Upload Download	Undo	Save		Clo	se		

Figure 6 - Core Configuration Window, Module Configuration



Long Name	Level	Туре	Value Range	Documentation
iDirect Console Password	1	String	-	This is the Console Password used to log into the modem
iDirect Console Username	1	String	-	This is the Console Username used to log into the modem
iDirect Manual Offline	4	String	-	<ul><li>This is a flag to manually command the modem to go offline. Telnet must be active.</li><li>0 = disabled</li><li>1 = enabled</li></ul>
iDirect Manual Online	4	String	-	<ul> <li>This is a flag to manually command the modem to go online. Telnet must be active.</li> <li>0 = disabled</li> <li>1 = enabled</li> </ul>
iDirect SNR Lock Threshold	1	String	-	The SNR value that is necessary to declare lock
iDirect Socket Delay	1	String	-	The amount of delay to add to the socket read in microseconds
iDirect Telnet Command	1	String	-	The Telnet Command the iDirect requires to begin a Telnet session
iDirect Telnet Password	1	String	-	This is the Telnet Password used when accessing Telnet within the modem
iDirect Telnet Username	1	String	-	This is the Telnet Username used when accessing Telnet within the modem
iDirect Use Automated TX Offline Logic	1	Value	0-1	<ul> <li>The setting to use the automated transmit offline logic to protect against adjacent satellite interference.</li> <li>0 = Do not use transmit logic</li> <li>1 = Use transmit logic. Perform offline commands</li> </ul>

### **3.2. Target Configuration Items**

The two iDirect target configuration items can be accessed using the AAQRemote GUI.

Path
Main Window $\rightarrow$ View $\rightarrow$ Configuration $\rightarrow$ Target
Level 1



🛃 Configuration		– 🗆 ×
Core Target Signal Feed	Search Keyword: iDirect	Search Clear
Profile	Name: iDirect Validation	Add Remove
Acquisition Source	Current Satellite: GALAXY 18 (G-18) (123 00 W Hori	izontal)
Scan Source: iDirect ~		201 Kaly
Coarse Source: iDirect ~	Satellite Quick Select: GALAXY 18 (G-18) (123.00 W, Hor	izontal) 🗸 🗸
Fine Source: iDirect ~		
Ð	Image: Target Specific         iDirect Beam ID       0         iDirect Use Beam Selection       False	
	iDirect Beam ID The beam ID that the controller will set the iDirect modem to to Default [0] Min f01. Max [9999]	use during acquisition.
Upload Download	Undo Save	Close

Figure 7 - Target Configuration

Long Name	Level	Туре	Value Range	Documentation
iDirect Beam ID	1	Value	0 - 9999	The Beam ID the controller will set the iDirect modem to use during acquisition if 'iDirect Use Beam Selection' is set to 'True'
iDirect Use Beam Selection	1	Choice	True - False	Set this switch to True to have the controller control the Beam ID the iDirect modem will use for acquisition
Scan Source	1	Choice	All available signal sources	The Signal Source used to Scan for the Target satellite. Set this to iDirect.
Coarse Source	1	Choice	All available signal sources	The Signal Source used to Coarse Peak on the Target satellite. Set this to iDirect.
Fine Source	1	Choice	All available signal sources	The Signal Source used to Fine Peak on the Target satellite. Set this to iDirect.



#### 3.3. Signal Configuration Items

The controller polls the modem for signal information that is used to correctly point the antenna. In this case the modem's SNR value is used to peak the signal at its maximum. The following are recommended settings to ensure the movement of the physical antenna is not faster than the polling speed of the signal data.

th				
n Window $\rightarrow$ View $\rightarrow$	Configuration $\rightarrow$ Signal			
ol 4	0			
614				
-				
M Configuration				- 🗆 🕳 X
	Search Keyword:		Search	Clear
Core Target Signal Fee	ed			
None				
RSL	Coarse Peaking Cycles Maximum	1 🖌	<u> </u>	
AVLReceiver	Coarse Peaking Cycles Minimum	1	<u>}</u>	
iDirect	Coarse Peaking Cycles Signal Threshold	10	•	
	Coarse Peaking Mode	CrossPattern 4		
	Coarse Peaking Travel Azimuth Limit	4 000		
	Coarse Peaking Travel Elevation Limit	4 000		
	Cross Pattern Coarse Azimuth Velocity	2	<u> </u>	
	Cross Pattern Coarse Elevation Velocity	2	2	
	Cross Pattern Coarse Peaking Height	1.000	<u>&gt;</u>	
	Cross Pattern Coarse Peaking Width	2.000	<u>&gt;</u>	
	Cross Pattern Coarse Signal Tolerance	10.000	<u>&gt;</u>	
	Cross Pattern Fine Azimuth Velocity	0.100	<u>&gt;</u>	
	Cross Pattern Fine Elevation Velocity	0.100	<u>&gt;</u>	
	Cross Pattern Fine Peaking Height	0.500	<u>&gt;</u>	
	Cross Pattern Fine Peaking Width	1.000	<u> </u>	-
	Cross Pattern Fine Signal Tolerance	10.000	<u> </u>	=
	Fine Peaking Cycles Maximum	1 🗲	<u> </u>	
	Fine Peaking Cycles Minimum	1	<u> </u>	
	Fine Peaking Cycles Signal Threshold	10.000		
	Fine Peaking Mode	CrossPattern	<u> </u>	
	Fine Peaking Travel Azimuth Limit	20.000		
	Fine Peaking Travel Elevation Limit	20.000	_	
	Line Scan Failure Elevation Step Size	1.000		
	Line Scan Maximum Elevation Steps	0		
	Modem Maximum Wait Time	2		
	Modem Minimum Wait Time	20		
	Peak Dwell Iterations	20		
	Peaking Ignore Noise Level	No		
	Plateau Peaking Coarse Azimuth Velocity	0.2		
	Plateau Peaking Coarse Elevation Velocity	0.2		
	Plateau Peaking Fine Azimuth Velocity	0.2		
	Plateau Peaking Fine Elevation Velocity	0.2		

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Polarization Dwell Iterations

Polarization Peaking Step

Scan Azimuth Velocity

Scan Azimuth Velocity

Upload

Download

Polarization Peaking Enabled

Polarization Peaking Travel Limit

Polarization Peaking Signal Tolerance

Undo

Azimuth scanning maximum velocity used in scanning movements Default [0.500] Min [0.1]. Max (Full Speed Azimuth Velocity) [3.000]

Figure 8 - Signal Configuration Window

Save

100

No

5.000

0.100

1.000

Close

.75



Long Name	Level	Туре	Value Range	Recommended Value	Documentation
Coarse Peaking Cycles Maximum	4	Integer	0 to 10	1	The maximum number of cycles to attempt for coarse peaking.
Coarse Peaking Cycles Minimum	4	Integer	0 to 10	1	The minimum number of cycles to attempt for coarse peaking. [Note: If set to 1 Coarse Peaking Cycles Maximum will be ignored]
Coarse Peaking Mode	4	Choice	None, CrossPattern, StepPatten, PlateauPeaking	CrossPattern	Selection of the peaking method to use for coarse peaking routines
Cross Pattern Coarse Azimuth Velocity	4	Float	.02 to 1	0.2	Azimuth velocity in degrees/sec for coarse peaking
Cross Pattern Coarse Elevation Velocity	4	Float	.02 to 1	0.2	Elevation velocity in degrees/sec for coarse peaking
Cross Pattern Coarse Peaking Height	4	Float	.25 to 5	1	Height in degrees to scan during a coarse cross pattern peaking function
Cross Pattern Coarse Peaking Width	4	Float	.25 to 5	2	Width in degrees to scan during a coarse cross pattern peaking function
Cross Pattern Coarse Signal Tolerance	4	Float	0 to 1000	10	Signal degradation amount before a scan stops
Cross Pattern Fine Azimuth Velocity	4	Float	0.02 to 0.5	0.1	Azimuth velocity in degrees/sec for fine peaking
Cross Pattern Fine Elevation Velocity	4	Float	0.02 to 0.5	0.1	Elevation velocity in degrees/sec for fine peaking



Cross Pattern Fine Peaking Height	4	Float	0.25 to 5.0	0.5	Height in degrees to scan during a fine cross pattern peaking function
Cross Pattern Fine Peaking Width	4	Float	0.25 to 5.0	1.00	Width in degrees to scan during a fine cross pattern peaking function
Cross Pattern Fine Signal Tolerance	4	Float	0.0 to 1000	10.0	Signal degradation amount before a scan stops
Fine Peaking Cycles Maximum	4	Float	1 to 10	1	The maximum number of cycles to attempt for fine peaking
Fine Peaking Cycles Minimum	4	Float	1 to 10	1	The minimum number of cycles to attempt for fine peaking [Note: If set to 1 Fine Peaking Cycles Maximum will be ignored]
Fine Peaking Mode	4	Choice	None, CrossPattern, StepPatten, PlateauPeaking	CrossPattern	Selection of the peaking method to use for fine peaking routines
Line Scan Failure Elevation Step Size	4	Float	0.0 to 5.0	1	The amount of each El step to make when an Az scan fails
Line Scan Maximum Elevation Steps	4	Float	1.0 to 50	0	Initial scan plus the number of El steps to make when an Az scan fails

### **3.4. Feed Configuration Items**

There are not Feed configuration items associated with this module.

### **Functional Overview**

When properly configured, the iDirect modem is fully integrated into the AvL AAQ's acquisition process, and can be used as a signal source to acquire and track on satellite signals. Once the target satellite has been found, the modem will log into the network and be ready to send traffic.





#### 4.1. Acquisition Process

Command	
Stop	Move to
Manual Control	Repeak
O Home	Peak
Stow	Track
Acquire	S X Pol

Figure 9 - Acquire Command

- **1.** Power up the antenna
- Command the antenna to acquire
   The AAQ will initialize sensors, read the compass, then proceed to the first scan point
- 3. The antenna detects a lock from the modem and stops

The Modem has detected the satellite carrier

The AAQ has stopped its scan

- The AAQ will coarse peak back to the signal
   This is the initial coarse peak that will move through the entire beam
- Once coarse peaking has been completed, fine peaking will begin This fine peaks the signal using small, slow movements
- 6. AAQ will stop movement

The AAQ has enabled transmit on the modem

The Modem will log into the network and be ready to send traffic

#### 4.2. Sensor Outputs

Path Main Window → View→ Sensor Output Level 0





Check the boxes beside any Sensor Outputs you wish to view for monitoring operations.

Sensor	Sensor Output							
	idir	Search Clear						
Requi	est tes Label	▲ Value						
<b>V</b>	iDirect Beam Name	AMC-9 8K - Evolution (DVB						
1	iDirect Detected Noise	0.110						
<b>V</b>	iDirect Min Lock Signal	0.000						
<b>V</b>	iDirect Min Valid Signal	0.000						
<b>V</b>	iDirect Rx Lock	Locked						
J	iDirect Rx Sig.	14.199						
<b>V</b>	iDirect Signal Average	14.162						
	iDirect Signal Gradient	0.006						

Figure 10 – Sensor Output

The table below describes the Sensor Outputs relevant to this module

ltem	Description
iDirect Beam Name	If entered, this is the customers name for each beam in a network.
iDirect Detected Noise	A measure of unwanted signal power used for calculating the SNR (Signal Noise Ratio)
iDirect Min Lock Signal	Not used in iDirect R11.9 – Display zero
iDirect Min Valid Signal	Not used in iDirect R11.9 - Display zero
iDirect Rx Lock	Flag that indicates whether iDirect unit has declared carrier lock.
iDirect Rx Signal	Receive signal strength as read from modem.
iDirect Signal Average	Readout of average signal as read from AAQ
iDirect Signal Gradient	Mathematical approximation of signal change over time in coordination with "iDirect Gradient Sample Time" config. Item as read from AAQ.

#### 4.3. Module Window

#### 4.3.1. Device Window

From the AAQRemote GUI, open the Device Window. The module returns data from its communications in this window.

Path	
Main Window $\rightarrow$ View $\rightarrow$ Device Window	
Level 0	

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Current Device Stats				
Device In Use:	iDirect			
Rx SNR	12.200000			
Modern Locked	locked			
AAQ Locked	true			
Console Logged in	true			
Telnet Logged in	true			
	S Read = 110000 6 (1,1)			
Error Msg	None			
Debug	rx s⊓r			

Figure 11 – Device Window

Item	Description
Rx SNR	The Signal to Noise Ratio reported by the modem.
Modem Locked	The locked status of the iDirect modem.
AAQ Locked	The locked status of the controller.
Console Logged in	A true or false indicator that shows if the controller has successfully logged into the console interface.
Telnet Logged in	A true or false indicator that shows if the controller has successfully logged into the telnet interface
Error Msg	Displays the current error message: None = No issues Port size=X Set size=Y = User has not provided network/com settings Bad Write to Modem = Controller was not successful sending data Comm. Timeout = Controller did not receive data from the modem
Debug	Displays debug information such as a sample of the string sent to the modem.
Modem Locked	The locked status of the iDirect modem.

#### 4.3.2. Device Control Window

5. A Device Control Window is not needed for monitoring operation and is not included in the software.

### **Issues and Troubleshooting**

lssue	Description	Corrective Action
AAQ will not communicate to Modem	Device Window does not say "iDirect" at the top	Check that the module has been installed. This can be done through the AAQRemote GUI's Help→Version Info. Check that the iDirect is configured as





		the Scan, Coarse, and Fine Source for the selected Target
AAQ will not communicate to Modem	System in an alarm state "iDirect- Not Ready" Device Window shows "Not Connected" or "Establishing Comms"	Check the configuration items and make sure the iDirect modem module is configured to communicate through Serial or Ethernet. Check Serial or Ethernet cables and connections.
AAQ will not log into the Modem	The Device Window item "Console Logged in" is false.	Check that the Console username and password in the Core Configuration are correct for the modem.
AAQ will not log into the Modem	The Device Window item "Telnet Logged in" is false.	Check that the Telnet username and/or password in the Core Configuration are correct.
		The appropriate Telnet command should also be identified. The default value "telnet 0" could be modified by the iDirect options file. In some cases this changes the location of the telnet to a specific IP address (ex. "telnet 10.1.1.1").
AAQ will not acquire or loses Signal Lock during Peaking	"All signal sources tried with no valid signal detected" or "Invalid Signal For Peaking" error message reached after an attempted acquire.	Check that the AAQ is communicating with the modem.
		Check that the correct target profile is selected and that it is configured properly.
		Check that the Scan and Peaking parameters are configured correctly in the Signal tab of the Configuration Window
		Check all RF cables and connections.