

PROGRAMMER'S MANUAL ACE9600

For use with ACE9600 firmware versions later than 1.0



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Contacting **dBm**

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REMOTE OPERATION OVERVIEW

The ACE9600 device can be controlled remotely using its LAN interface. The instrument can be connected to any IEEE-802 network. It uses TCP/IP, and achieves transfer rates up to approximately 10/100 MBPS.

Programming control of the ACE9600 can be implemented by using the ACE9600 LAN client application called *AceClient* provided by dBm or by sending text commands directly via a valid socket connection to the control port.

In addition, parameter files may be downloaded or uploaded by the ACE9600 via the data port, or files may be deleted from the ACE9600 memory through text commands to the control port.

A complete description of both the *AceClient* and the ACE9600 text command syntax are given in this manual.

Text Command Overview

The text command syntax used to remotely control the ACE9600 was designed for ease of use, readability and tracking over socket monitoring programs. The commands begin with an action word, followed by an optional group name, channel number, parameter name and parameter value.

For more information about the ACE9600 text command syntax, see **USING REMOTE TEXT COMMANDS.**

Client Application Overview

AceClient is a Windows[®] application that interfaces with the ACE9600. The application provides graphical user interface (GUI) to:

- Display or modify parameters on the device
- Download, upload or delete dynamic data files from the device
- Store or recall settings that have been saved on the device

The application saves a list of recently used IP address between executions of the program using the Windows[®] INI file system, and has the ability to save or load complete configuration settings under a custom file name.

For more information about the features provided by *AceClient*, see **CLIENT APPLICATION FEATURES.**

For detailed instructions on using the client application, see USING THE CLIENT APPLICATION.

USING REMOTE TEXT COMMANDS

This section details the text command syntax used to remotely control the ACE9600 over a LAN interface. The command descriptions are grouped by similar function. For a summary of the text command syntax in table form, see **Appendix B: Text Message** Format.

In general, all text commands begin with an action word,

```
e.g., "Get", "Abort", "Start"...
```

followed by an optional group name,

e.g., "Mode", "Param", "Dynamic" ...

channel number,

e.g., "Ch1", "Ch2" ...

parameter name,

e.g., "DelayInterval", "Delay"...

or parameter setting,

e.g., "Enabled", "On", "1200.13" ...

Commands are case-insensitive, where each command word is separated by an ASCII space character.

Please note that all text commands and text responses are sent or received through the control port connection (5555). All binary data used for file download, file upload or capture data is through the data port connection (5556).

Connect and Open Commands

The commands described in this section are used for connecting, disconnecting, opening, and closing the control or data sockets.

Connecting to the ACE

Syntax:

Hello

Function:

After a socket connection has been established with the instrument's control port, this is first command that should be sent to the control port to verify that it is receiving and responding to text messages.

Returns:

Nak : <error message> or

Ack: Hello

Where:

<error message> Descriptive text describing cause of error

Disconnecting from the ACE

Syntax:

Goodbye

Function:

This is the last command that should be sent to the control port to inform the instrument that remote communications are ending. The instrument will close the control port socket after transmitting the final return message and begin listening for a new socket connection request.

Returns:

```
Nak: <error message>
or
Ack: Goodbye
Where:
<error message> Descriptive text describing cause of error
```

Opening the Data Port

Syntax:

Open DataPort

Function:

Instructs the ACE to open the data port and await connection by the client.

Returns:

Nak: <error message>

or

Ack: DataPort Opened

Where:

```
<error message> Descriptive text describing cause of error
Example:
```



Sent command -Open DataPort Received command -Ack: DataPort Opened

Notes:

• Send this command to the control port before uploading a file, downloading file or uploading capture data. After the command has been acknowledged, open a socket to the data port and begin file or capture transfers.

Closing the Data Port

Syntax:

Close DataPort

Function:

Instructs the ACE to close the data port.

Returns:

Nak: <error message>

or

Ack: DataPort Closed

Where:

<error message> Descriptive text describing cause of error

Example:

Sent command -

Close DataPort

Received command -

Ack: DataPort Closed

Notes:

- Send this command after finishing all file and capture transfers, as well as before disconnecting from the control port.
- If further file or capture transfers are needed, reopen the data port by sending the "Open DataPort" command and opening a socket to the data port.

Mode Commands

The commands described in this section are related to obtaining or changing the mode of the instrument.

Getting the Mode

Syntax:

Get Mode Function: Returns the current Mode of the instrument. Returns:

Nak: <error message>

or

Ack: Mode <setting> Where: <error message> Descriptive text describing cause of error <setting> Static/Dynamic Example: Sent command - Get Mode Received command -Ack: Mode Static

Changing the Mode

Syntax:

Set Mode <setting >

Function:

Changes the Mode of the instrument to either the Static or Dynamic mode.

Returns:

Nak: <error message>

Ack: Mode <setting >

or

Where:

<error message> Descriptive text describing cause of error
<setting> Static/Dynamic

Example:

Sent command -Set Mode Dynamic Received command -Ack: Mode Dynamic

Storing and Recalling Settings

The commands described in this section are related to storing and recalling settings in the instrument's on-board memory.

Storing a Current Setting on the Instrument

Syntax:

Store Settings <index>

Function:

Saves the current instrument settings in the on-board memory.

Returns:

Nak: <error message>

or

Ack: Settings <index>

Where:

```
<error message> Descriptive text describing cause of error
<index> 0 to 8
```

Example:

Sent command -

Store Settings 3

Received command -

Ack: Settings 3

Notes:

- Setting 0 is the same as the "Preset" button on the instruments front panel.
- Recalling a Setting on the Instrument

Syntax:

Recall Settings <index>

Function:

Recalls a saved setting from the on-board memory to replace the current instrument settings.

Returns:

Nak: <error message>

or

Ack: Settings <index>

Where:

<error message> Descriptive text describing cause of error <index> 0 to 9

Example:

Sent command -

```
Recall Settings 4
```

Received command -

```
Ack: Settings 4
```

Notes:

- Setting 0 is the same as the "Preset" button on the instruments front panel.
- Setting 9 is the default factory settings and cannot be changed.

Options Settings Commands

The commands described in this section are related to obtaining the factory settings of the instrument, enabling the Multipath Function, or changing the Capture Point.

Obtaining Version Related Settings

Syntax:

Get Version <type > Function:

Returns the Software Version, Serial Number, or Model Number of the instrument.

Returns:

Nak: <error message>

or

Ack: Version <type > <string>

Where:

<error message=""></error>	Descriptive text describing cause of error
<type></type>	SwVersion/SerialNumber/ModelNumber
<string></string>	ASCII string

Example:

Sent command -

Get Version ModelNumber

Received command -

Ack: Version ModelNumber ACE9600-4-1125

Notes:

• These options cannot be changed without factory maintenance by dBm-Corp.

Obtaining Factory Option Related Settings

Syntax:

Get Options <channel> <type>

Function:

Returns the installation state for Fading license, AWGN license, channel board installation, or RF Slave configuration

Returns:

Nak: <error message>

or

Ack: Options <channel> <type> <status>

Where:

<error message=""></error>	Descriptive text describing cause of error
<channel></channel>	Ch1/Ch2/Ch3/Ch4
<type></type>	FadingLicense/AwgnLicense/
	Installed/RfSlave
<status></status>	Enabled/Disabled

Example:

Sent command -

Get Options Ch1 AwgnLicense

Received command -

Ack: Options Ch1 AwgnLicense Enabled

Notes:

• These options cannot be changed without factory maintenance by dBm-Corp.

Getting Non-Factory Option Related Settings

Syntax:

Get Options <channel> < type >

Function:

Returns the current setting for the Multipath and Capture Point options. Returns:

Nak: <error message>

or

Ack: Options <channel> < type > < setting >

Where:

<error message=""></error>	Descriptive text describing cause of error
<type></type>	Multipath/CapturePoint
<channel></channel>	Ch1/Ch2/Ch3/Ch4
<setting></setting>	One of these valid choices:
-	Multipath Enabled/Disabled
	CapturePoint Before/After

Example:

Sent command -

Get Options Ch1 Multipath

Received command -

Ack: Options Ch1 Multipath Enabled

Changing Setting for Non-Factory Option Related Settings

Syntax:

Set Options <channel> < type > <setting>

Function:

Changes the current setting for the Multipath and Capture Point Function. Returns:

Nak: <error message>

or

Ack: Options <channel> < type > < setting >

Where:

<error message=""></error>	Descriptive text describing cause of error
<type></type>	Multipath/CapturePoint
<channel></channel>	Ch1/Ch2/Ch3/Ch4
<setting></setting>	One of these valid choices:
	Multipath Enabled/Disabled
	CapturePoint Before/After

Example:

Sent command -

Set Options Ch1 Multipath Enable

Received command -

Ack: Options Ch1 Multipath Enabled

Notes:

- The Multipath option allows for the entire multipath function to be disabled or enabled. This has the same effect as turning all of the paths off, but allows for the paths to be returned to their original settings by simply enabled the Multipath option.
- The Capture Point option allows the signal to be captured either before or after the delay is emulated.

Dynamic Mode Related Commands

The commands described in this section are related to parameters and actions that are valid in the Dynamic mode.

Starting a Dynamic Run

Syntax: Start Function: Starts or restarts the dynamic run when in the dynamic mode while paused or ready. Returns: Nak: <error message> or Ack: Dynamic State <state> Where: <error message> Descriptive text describing cause of error <state> Running/Done/Armed

Example:

Sent command -Start Received command -Ack: Dynamic State Armed

Resetting a Dynamic Run

Syntax:

Reset

Function:

Resets the dynamic run when in the dynamic mode while running, paused or done.

Returns:

Nak: <error message>

or

Ack: Dynamic State Ready

Where:

<error message> Descriptive text describing cause of error
Example:
Sent command Reset
Received command -

Ack: Dynamic State Ready

Pausing a Dynamic Run

```
Syntax:
```

Pause

Function:

Pauses the dynamic run when in the dynamic mode while running. Returns:

Nak: <error message>

or

Dynamic State <state>

Where:

<error message=""></error>	Descriptive text describing cause of error
<state></state>	Paused/Done/Armed

Example:

Sent command -

Pause Received command -Ack: Dynamic State Paused

Incrementing a Dynamic Run

Syntax:

StepFwd <setting>

Function:

Increments the dynamic run by the number of msec specified by <setting> when in the dynamic mode while paused or ready.

Returns:

Nak: <error message>

or **Ack:**

Where:

<error message=""></error>	Descriptive text describing cause of error
<setting></setting>	Time in msec

Dynamic ElapsedTime <setting>

Example:

Sent command -Step Fwd 10 Received command -Ack: Dynamic ElapsedTime 50

Decrementing a Dynamic Run

Syntax:

StepBack <setting>

Function:

Decrements the dynamic run by the number of msec specified by <setting> when in the dynamic mode while paused or ready.

Returns:

Nak: <error message>

or

Ack: Dynamic ElapsedTime <setting>

Where:

<error message=""></error>	Descriptive text describing cause of error
<setting></setting>	Time in msec

Example:

Sent command -StepBack 10 Received command -

Ack: Dynamic ElapsedTime 40

Getting Dynamic Run Parameters

Syntax:

Get Dynamic cparameter>

Function:

Returns the Trigger, Time Reference, Loop, Update, Multi Chassis Sync, Delay Interval, RF Interval, Multipath Interval, Elapsed Time, Start Time, or State while in the Dynamic mode.

Returns:

Nak: <error message>

or

Ack: Dynamic < parameter > < setting>

Where:

<error message=""></error>	Descriptive text describing cause of error
<parameter></parameter>	<setting></setting>
Trigger	Internal/External
Loop	Single/Continuous
MultiChassisSync	StandAlone/Master/Slave

dBm

Advanced Channel Emulator

 DelayInterval
 1/2/5/10/20/50/100/200/

 500/1000 (in msec)
 500/1000 (in msec)

 RfInterval
 100/200/500/1000 (in msec)

 MpathInterval
 100/200/500/1000 (in msec)

 Update
 Internal/External

Internal/External integer (in msec) integer (in msec) Static/Ready/Setup/Init/Running/ Paused/ Done/Armed

Example:

Sent command -

ElapsedTime StartTime

State

Get Dynamic Loop

Received command -

Ack: Dynamic Loop Continuous

Changing Dynamic Run Parameters

Syntax:

Set Dynamic cparameter> <setting>

Function:

Changes the Trigger, Time Reference, Loop Type, Multi Chassis Sync, Update, Delay Interval, RF Interval, Multipath Interval, Elapsed Time, Start Time, or State while in the Dynamic mode.

Returns:

Nak: <error message>

or

Ack: Dynamic < parameter > < setting>

Where:

<error message=""></error>	Descriptive text describing cause of error
<pre><parameter></parameter></pre>	<setting></setting>
Trigger	Internal/External
Loop	Single/Continuous
MultiChassisSync	StandAlone/Master/Slave
DelayInterval	1/2/5/10/20/50/100/200/
	500/1000 (in msec)
RfInterval	100/200/500/1000 (in msec)
MpathInterval	100/200/500/1000 (in msec)
Update	Internal/External
StartTime	integer (in msec)
Example:	
Sent command -	
Sat Dumamia D	olowIntorwol 50

Set Dynamic DelayInterval 50

Received command -

Ack: Dynamic DelayInterval 50

Notes:

• The parameter **DelayInterval** sets the interval for Delay, Frequency Offset, Attenuation, Phase Offset, and Noise Density type files.

Beginning Dynamic Setup

Syntax:

Begin Dynamic Setup

Function:

Before changing dynamic run parameters or dynamic data file selections, the instrument must be placed in the Setup state. Once the state is acknowledged as **Setup**, changes in the dynamic run parameters or dynamic data file selections may begin. See **Changing Selected File for Dynamic** for more information about selecting files for dynamic data parameters.

Returns:

Nak: <error message>

or

Ack: Dynamic State Setup

Where:

<error message> Descriptive text describing cause of error

Beginning Dynamic Init

Syntax:

Begin Dynamic Init

Function:

After changing dynamic run parameters or selecting files for dynamic data parameters, the instrument must be placed in the Init state to initialize the dynamic run to the starting point. Once the initialization procedure finishes and the state is acknowledged as **Ready**, the command to Start may be sent. See **Changing Selected File for Dynamic** for more information about selecting files for dynamic data parameters.

Returns:

Nak: <error message>

or Ack: Dynamic State Ready

Where:

<error message> Descriptive text describing cause of error

File Related Commands

The commands described in this section are related to setting or obtaining information about files that have been downloaded previously to the instrument. See **Getting the Delay Slew Boundary**

Syntax:

Get DelaySlewBoundary

Function:

Returns the current Delay Slew Boundary of the instrument.

Returns:

Nak: <error message>

or

Ack: DelaySlewBoundary <setting>

Where:

<error message> Descriptive text describing cause of error <setting> value (in msec)

Example:

Sent command -

Get DelaySlewBoundary

Received command -

```
Ack: DelaySlewBoundary 100
```

Changing the Delay Slew Boundary

Syntax:

Set DelaySlewBoundary <setting >

Function:

Changes the Delay Slew Boundary of the instrument.

Returns:

Nak: <error message>

or

Ack: DelaySlewBoundary <setting >

Where:

<error message> Descriptive text describing cause of error <setting> value (in msec)

Example:

Sent command -

Set DelaySlewBoundary 100

Received command -

Ack: DelaySlewBoundary 100

Calculating Noise Density

Syntax: Calculate

Function:

Calculates the Noise Density parameter for each channel based on the Noise Ratio parameter and the current Signal Power.

Returns:

Nak: <error message>

or

Ack: Calculated

Where:

<error message> Descriptive text describing cause of error

Example:

Sent command -Calculate

Received command -

Ack: Calculated

Notes:

- See Notes:
- **The Delay value** may also includes the status **Slewing**, which is separated from the value by an ASCII space character.
- Getting Settings for Noise Parameters about commands to retrieve the calculated status of each channel.
- The Noise Density parameter will only be calculated if the Noise Type for that channel is set to "EbNo".

Capturing Input Signals

Syntax:

Capture <channel>

Function:

Samples the incoming signal to a channel (or all channels) for retrieval later.

Returns:

Nak : <error message> or

Ack: Captured <channel>

Where:

<error message=""></error>	Descriptive text describing cause of error
<channel></channel>	Ch1/Ch2/Ch3/Ch4/All

Notes:

• The channel's incoming signal is captured when the command is received. See **Uploading Captured Data from a Channel** about commands to retrieve the captured data.



• The Capture Point option allows the signal to be captured either before or after the delay is emulated. See **Changing Setting for Non-Factory Option Related Settings** about commands to set the Capture Point.

Example:

Sent command -Capture Ch1 Received command -Ack: Captured Ch1

Downloading a Binary Dynamic Data File or **Uploading a Binary Dynamic Data File** for more information about commands to upload or download the dynamic files.

Getting the File Count

Syntax:

Get File Count

Function:

Returns the number of dynamic data files that have previously been downloaded to the instrument.

Returns:

Nak: <error message>

or

Ack: File Count <number>

Where:

<error message> Descriptive text describing cause of error <number> number of downloaded files

Example:

Sent command -Get File Count Received command -Ack: File Count 5

Deleting a Single File

```
Syntax:
```

Delete File <filename>

Function:

Removes a file from the file directory on the instrument.

Returns:

Nak: <error message>

or

Ack: File <filename> Deleted

Where:

<error message> Descriptive text describing cause of error

<filename> Filename with *.ace extension Example: Sent command -Delete File Dly1.ace Received command -Ack: File Dly1.ace Deleted

Deleting All Files

Syntax:

Delete File All

Function:

Removes all files from the file directory on the instrument.

Returns:

Nak: <error message>

or

Ack: File All Deleted

Where:

<error message> Descriptive text describing cause of error
Example:

Getting Downloaded File Information

Syntax:

Get File Info <filename>

Function:

Retrieves file information for the file with the given name.

Returns:

Nak: <error message>

or

Ack: File Info <filename> <type> <length> <continuous> <timestamp> Where:

Returns space delimited file information, where:

<error message=""></error>	Descriptive text describing cause of error
<filename></filename>	Filename
<type></type>	Delay/FreqOffset/Atten/
	PhaseOffset/RfIn/NoiseNo/Mpf
<length></length>	number of samples in the file
<continuous></continuous>	CONTINUOUS/DISCONTINUOUS
<timestamp></timestamp>	YYYY-MM-DD_HH:MM:SS

Example:

Sent command -

Get File Info Dly1.ace



Received command -

Ack: File Info Dly1.ace Delay 10 Continuous 2015-09-23 07:05:32

Notes:

• **RfIn** type files may be used for either RF Input or RF Output file selections.

Getting Downloaded File Size in Bytes

Syntax:

```
Get File SizeInBytes <filename>
```

Function:

Retrieves file size in bytes for the file with the given name.

Returns:

Nak: <error message> or Ack: File SizeInBytes <filename> <size> Where: Returns space delimited file information, where: <error message> Descriptive text describing cause of error <filename> Filename <size> File size in bytes

Example:

Sent command -Get File SizeInBytes Dly1.ace Received command -Ack: File SizeInBytes Dly1.ace 1024

Getting Selected File for Dynamic Data Parameters

Syntax:

Get File <channel> <parameter>

Function:

Returns the filename that is currently selected for Dynamic mode Delay, Frequency Offset, Attenuation, Phase Offset, RF Input, RF Output, Noise Density, or Multipath Fading.

Returns:

Nak: <error message> or

Ack: **File** <channel> <parameter> <filename>

Where:

<error message=""></error>	Descriptive text describing cause of error
<channel></channel>	CH1/CH2/CH3/CH4
<parameter></parameter>	Delay/FreqOffset/Atten/
	PhaseOffset/RfIn/RfOut/NoiseNo/Mpf

<filename> Filename or None
Example:
 Sent command Get File Ch1 Delay
Received command Ack: File Ch1 Delay None

Changing Selected File for Dynamic Data

Syntax:

Set File <channel> <parameter> <filename>

Function:

Selects the filename to be used for Dynamic mode Delay, Frequency Offset, Attenuation, Phase Offset, RF Input, RF Output, Noise Density, or Multipath Fading.

Returns:

Nak: <error message>

or

Ack: File <channel> <parameter> <filename>

Where:

<error message=""></error>	Descriptive text describing cause of error
<channel></channel>	CH1/CH2/CH3/CH4
<parameter></parameter>	Delay/FreqOffset/Atten/
	PhaseOffset/RfIn/RfOut/NoiseNo/Mpf
<filename></filename>	Filename or None
nnle	

Example:

Sent command -Set File Ch1 Dly1.ace Received command -Ack: File Ch1 Delay Dly1.ace

Static Mode Related Commands

The commands described in this section are related to parameters and actions that are valid in the Static Mode.

Getting Settings for Link Parameters

Syntax:

Get Param <channel> <parameter>

Function:

Returns the current setting for Delay, Frequency Offset, Phase Offset,

Attenuation, RF Input, RF Output and Signal Power.

Returns:

dBm

	Nak:	<error m<="" th=""><th>nessage></th><th></th><th></th></error>	nessage>			
	or					
	Ack:	Param	<channel> <paran< th=""><th>neter> <settin< th=""><th>g></th></settin<></th></paran<></channel>	neter> <settin< th=""><th>g></th></settin<>	g>	
Whe	ere:					
	<error n<="" td=""><td>nessage></td><td>Descriptive te</td><td>ext describing</td><td>cause of error</td></error>	nessage>	Descriptive te	ext describing	cause of error	
	<channe< td=""><td>el></td><td>CH1/CH2/C</td><td>н3/сн4</td><td></td></channe<>	el>	CH1/CH2/C	н3/сн4		
	<param< td=""><td>eter></td><td>Delay/Fre</td><td>qOffset/P</td><td>haseOffset/</td></param<>	eter>	Delay/Fre	qOffset/P	haseOffset/	
			Atten/RfI	Atten/RfIn/RfOut/SigPower		
<setting></setting>		Value with de	efault units:			
			Delay	(in msec)	Slewing (only if slewing)	
			FreqOffset	(in kHz)		
			PhaseOffset	(in deg)		
			Atten	(in dB)		
			RfIn	(in MHz)		
			RfOut	(in MHz)		
			SigPower	(in dBm)	InRange/Overflow	
Exa	mple:					

Sent command -

Get Param Ch1 Delay

Received command -

```
Ack: Param Ch1 1000.3400000
```

Notes:

- The Delay value may also includes the status **Slewing**, which is separated from the value by an ASCII space character.
- The Signal Power value also includes the status of the measurement as either **InRange** or **Overflow**, which is separated from the value by an ASCII space character.

Changing Settings for Link Parameters

Syntax:

Set Param <channel> <parameter> <setting>

Function:

Changes the current setting for Delay, Frequency Offset, Phase Offset, Attenuation, RF Input, and RF Output.

Returns:

Nak: <error message>

or

Ack: Param <channel> channel> <setting>

Where:

<error message=""></error>	Descriptive text describing cause of error
<channel></channel>	CH1/CH2/CH3/CH4
<parameter></parameter>	Delay/FreqOffset/PhaseOffset/

Atten/RfIn/RfOut

Value with default units:Delay(in msec)FreqOffset(in kHz)PhaseOffset(in deg)Atten(in dB)RfIn / RfOut(in MHz)

Slewing (only if slewing)

Example:

Sent command -

<setting>

Set Param Ch3 Atten 10.5

Received command -

Ack: Param Ch3 Atten 10.5

Notes:

• The Delay value may also includes the status **Slewing**, which is separated from the value by an ASCII space character.

Getting Settings for Noise Parameters

Syntax:

Get Param <channel> <parameter>

Function:

Returns the current setting for Noise Density, Noise Bitrate, Noise Ratio, Noise Mode, Noise Enable Status, Calculated Status, and Range Status.

Returns:

Nak: <error message>

or

Ack: Param <channel> <parameter> <setting>

Where:

<error message=""> <channel></channel></error>	Descriptive text describing cause of error CH1/CH2/CH3/CH4		
<parameter></parameter>	NoiseNo/NoiseBr/NoiseEbNo/ NoiseMode/NoiseEnable/ CalcStatus/RangeStatus		
<setting></setting>	CalcStatus/RangeStatusValue with default units or one of valid choices:NoiseNo(in dBm/Hz)NoiseBr(in MHz)NoiseEbNo(in dB)NoiseModeNo/EbNoNoiseEnableOff/OnCalcStatusCalculated/NotCalculatedRangeStatusInPange/OutOfPange		

Example:

dBm

Sent command -Get Param Ch2 Noise Received command -Ack: Param Ch2 Noise -90.50

Changing Settings for Noise Parameters

Syntax:

Set Param <channel> <parameter> <setting>

Function:

Changes the current setting for Noise Density, Noise Bitrate, Noise Ratio, Noise Mode and Noise Enable Status.

Returns:

Nak: <error message>

or

Ack: Param <channel> channel> <setting>

Where:

<error message=""></error>	Descriptive te	ext describing cause of error	
<channel></channel>	CH1/CH2/C	Н3/СН4	
<parameter></parameter>	NoiseNo/NoiseBr/NoiseEbNo/		
	NoiseMode	/NoiseEnable	
<setting></setting>	Value with default units or one of valid choices:		
	NoiseNo	(in dBm/Hz)	
	NoiseBr	(in MHz)	
	NoiseEbNo	(in dB)	
	NoiseMode	No/EbNo	
	NoiseEnable	Off/On	

Example:

Sent command -

```
Set Param Ch2 NoiseEnable On
```

Received command -

Ack: Param Ch2 NoiseEnable On

Getting Settings for Fading Parameters

Syntax:

Get Param <channel> **Mpf** <path> <parameter>

Function:

Returns the current setting for Multipath Delay, Doppler, Loss, Path Type, Correlation Path, Correlation Value, K Factor, AoA, Ratio and Std Dev. Returns:

Nak: <error message>
or
Ack: Param <channel> Mpf <path><parameter> <setting>

Where:

where.			
<error message=""></error>	Descriptive text describing cause of error		
<channel></channel>	CH1/CH2/CH3/CH4		
<path></path>	PATH1/PATH2/PATH3/PATH4/		
	PATH5/PAT	H6	
<pre><parameter></parameter></pre>	Delay/Doppler/Loss/Type/CorrPath/		
	CorrVal/K	factor/Aoa/Ratio/StdDev	
<setting></setting>	Value with de	fault units or one of valid choices:	
	Delay	(in usec)	
	Doppler	(in Hz)	
	Loss	(in dB)	
	Туре	Off/Cw/Ray/Rice	
	CorrPath	PATH1/PATH2/PATH3/PATH4/	
		PATH5/PATH6	
	CorrVal	(in %)	
	Kfactor	(in dB)	
	Aoa	(in deg)	
	Ratio	(in Hz)	
	StdDev	(in dB)	
Example:			
Sent command -			
Get Param	Ch2 Mpf Pa	ath1 Aoa	
Received command -			
Ack: Para	n Ch2 Mpf	Path1 Delay 45	
Changing Settings for Fa	ding Paramet	ers	
Svntax:			
Set Param <chan< td=""><td>nel> Mpf <pa< td=""><td>th> <parameter> <setting></setting></parameter></td></pa<></td></chan<>	nel> Mpf <pa< td=""><td>th> <parameter> <setting></setting></parameter></td></pa<>	th> <parameter> <setting></setting></parameter>	
Function:	- 1	1 0	
Changes the current s	etting for Mult	ipath Delay, Doppler, Loss, Path Type,	
Correlation Path. Cor	relation Value.	K Factor. AoA. Ratio and Std Dev.	
Returns:	· · · · · · · · · · · · · · · · · · ·	, . ,	
Nak: <error messa<="" th=""><th>ige></th><th></th></error>	ige>		
or	C		
Ack: Param <ch< td=""><td>annel> Mpf <</td><td><path> <parameter> <setting></setting></parameter></path></td></ch<>	annel> Mpf <	<path> <parameter> <setting></setting></parameter></path>	
Whore	· · · •		

Where:

<error message=""></error>	Descriptive text describing cause of error
<channel></channel>	CH1/CH2/CH3/CH4
<path></path>	PATH1/PATH2/PATH3/PATH4/
	PATH5/PATH6
<pre><parameter></parameter></pre>	Delay/Doppler/Loss/Type/CorrPath/

CorrVal/Kfactor/Aoa/Ratio/StdDev

<setting></setting>	Value with de	efault units	or one of	valid choices:
	Delay	(in usec)		

Doppler (in Hz) Loss (in dB) Type Off/Cw/Ray/Rice CorrPath PATH1/PATH2/PATH3/PATH4/ PATH5/PATH6 CorrVal (in %) Kfactor (in dB) Aoa (in deg) Ratio (in Hz) StdDev (in dB)

Example:

Sent command -

Set Param Ch2 Mpf Path1 CorrPath Path6 Received command -

Ack: Param Ch2 Mpf Path1 CorrPath Path6

Getting the Delay Slew Boundary

Syntax:

Get DelaySlewBoundary Function:

Returns the current Delay Slew Boundary of the instrument.

Returns:

Nak : <error message> or

Ack: DelaySlewBoundary <setting>

Where:

<error message> Descriptive text describing cause of error <setting> value (in msec)

Example:

Sent command -

Get DelaySlewBoundary Received command -Ack: DelaySlewBoundary 100

Changing the Delay Slew Boundary

Syntax:

Set DelaySlewBoundary <setting >

Function:

Changes the Delay Slew Boundary of the instrument.

Returns: Nak: <error message> or Ack: DelaySlewBoundary <setting > Where: <error message> Descriptive text describing cause of error <setting> value (in msec) Example:

Sent command -

Set DelaySlewBoundary 100

Received command -

Ack: DelaySlewBoundary 100

Calculating Noise Density

Syntax:

Calculate

Function:

Calculates the Noise Density parameter for each channel based on the Noise Ratio parameter and the current Signal Power.

Returns:

Nak: <error message> or

Ack: Calculated

Where:

<error message> Descriptive text describing cause of error

Example:

Sent command -

Calculate

Received command -

Ack: Calculated

Notes:

- See Notes:
- **The Delay value** may also includes the status **Slewing**, which is separated from the value by an ASCII space character.
- Getting Settings for Noise Parameters about commands to retrieve the calculated status of each channel.
- The Noise Density parameter will only be calculated if the Noise Type for that channel is set to "EbNo".

Capturing Input Signals

Syntax:

Capture <channel>

Function:

Samples the incoming signal to a channel (or all channels) for retrieval later. Returns:

Nak: <error message>

or

Ack: Captured <channel>

Where:

<error message=""></error>	Descriptive text describing cause of error
<channel></channel>	Ch1/Ch2/Ch3/Ch4/All

Notes:

- The channel's incoming signal is captured when the command is received. See **Uploading Captured Data from a Channel** about commands to retrieve the captured data.
- The Capture Point option allows the signal to be captured either before or after the delay is emulated. See **Changing Setting for Non-Factory Option Related Settings** about commands to set the Capture Point.

Example:

Sent command -

Capture Ch1 Received command -Ack: Captured Ch1

Downloading a Binary Dynamic Data File

The commands described in this section are related to downloading a previously converted binary dynamic data file to the instrument. Text commands are sent through the control port and binary data is sent through the data port. For an example of downloading a binary data file, see **File Download Protocol Example**.

Beginning the File Download

```
Syntax:
```

```
Begin File Transfer <filename> <size in bytes>
```

Function:

Informs the instrument that downloading will begin.

Returns:

Nak: <error message>

or

Ack: File Transfer Beginning

Where:

<error message=""></error>	Descriptive text describing cause of error
<filename></filename>	Filename

<size in bytes> Size of the entire binary data file in bytes

Notes:

• The **Begin File Transfer** command is sent through the control port of the instrument, and the acknowledgement or Nak comes through the control port.

Sending Binary Download Data

Syntax:

[binary data]

Function:

Binary data segments are sent through the data port of the instrument.

Returns:

Nak: <error message> or

Ack: File Transfer Next

Where:

```
<error message> Descriptive text describing cause of error
```

Notes:

- The binary data is sent through the data port, and the acknowledgment or Nak comes through the control port.
- The binary data size for each segment is limited to 8192 bytes.

Ending the File Download

Syntax:

```
End File Transfer <filename>
```

Function:

Informs the instrument that downloading has ended normally.

Returns:

Nak: <error message> or

```
Ack: File Transfer Ending
```

Where:

e i e	<error message=""></error>	Descriptive te	ext describing	cause of error
	<error message=""></error>	Descriptive te	ext describing	cause of error

<filename> Filename

Notes:

- The **End File Transfer** command is sent through the control port of the instrument, and the acknowledgement or Nak comes through the control port.
- Once the acknowledgment is received, another file transfer may begin.

Aborting the File Download

Syntax:

Abort File Transfer <filename>

Function:

Informs the instrument that downloading is terminating before completion. Returns:

Nak: <error message>

or

Ack: File Transfer Aborted

Where:

<error message=""></error>	Descriptive text describing cause of error
<filename></filename>	Filename

Notes:

• The **Abort File Transfer** command is sent through the control port of the instrument, and the acknowledgement or Nak comes through the control port.

File Download Protocol Example

The protocol (Figure 1 and Figure 31) for downloading a dynamic data file begins with the client application sending the **Open DataPort** command to the instrument's Control Port. Upon receiving acknowledgment back from the Control Port, the client application opens a socket and connects to the Data Port of the instrument. Upon successfully connecting to the Data Port, the client application then sends the **Begin**

File Transfer command to the instrument's Control Port. Upon receiving an acknowledgment back from the Control Port, the client application sends segments of binary to the Data Port. Each data segment that is sent on the Data Port will generate a text response on the Control Port. After the last segment has been sent to the Data Port, the client application sends the End File Transfer command to the Control Port. Once the acknowledgment is received through the Control Port, another file transfer may begin. After completing all downloads, the client application sends the Close DataPort command to the Control Port. Upon receiving acknowledgment back from the Control Port, the client application must close the data port connection.

Uploading a Binary Dynamic Data File

The commands described in this section are related to uploading a binary dynamic data file from the instrument. Text commands are sent to the control port and binary data is sent from the data port.

Beginning the File Upload

Syntax:

Begin File Uptransfer <filename>

Function:

Informs the instrument that uploading will begin. Returns:

```
Nak: <error message> or
```

Ack: File Uptransfer Beginning

Where:

<error message> Descriptive text describing cause of error <filename> Filename

Notes:

• The **Begin File Uptransfer** command is sent through the control port of the instrument, and the acknowledgement or Nak comes through the control port.

Receiving Binary Upload Data

Syntax:

Next File Uptransfer

Function:

Binary data segments are sent from the data port of the instrument.

Returns:

Nak: <error message>

or [binary data]

Where:

<error message> Descriptive text describing cause of error

Notes:

- The binary data is sent from the data port as the acknowledgement or the Nak comes through the control port.
- The binary data size for each segment is limited to 8192 bytes.

Ending the File Upload

Syntax:

```
End File Uptransfer <filename>
```

Function:

Informs the instrument that uploading has ended normally.

Returns:

or

Nak: <error message>

Ack: File Uptransfer Ending

Where:

<error message=""></error>	Descriptive text describing cause of error
<filename></filename>	Filename

Notes:


- The **End File Uptransfer** command is sent through the control port of the instrument, and the acknowledgement or Nak comes through the control port.
- Once the acknowledgment is received, another file transfer may begin.
- See **Getting Downloaded File Size in Bytes** about obtaining the total file size (in bytes) that is expected from the upload.

Aborting the File Upload

Syntax:

```
Abort File Uptransfer <filename>
```

Function:

Informs the instrument that uploading is terminating before completion. Returns:

Nak: <error message>

or

Ack: File Uptransfer Aborting

Where:

<error message=""></error>	Descriptive text describing cause of error
<filename></filename>	Filename

Notes:

• The **Abort File Uptransfer** command is sent through the control port of the instrument, and the acknowledgement or Nak comes through the control port.

File Upload Protocol Example

The protocol (Figure 2 and Figure 32) for uploading a dynamic data file begins with the client application sending the **Open DataPort** command through the instrument's Control Port. Upon receiving acknowledgment back through the Control Port, the client application opens and connects to the Data Port of the instrument. Upon successfully connecting to the Data Port, the client application then sends the **Begin File Uptransfer** command through the instrument's Control Port. Upon receiving an acknowledgment back through the Control Port. Upon receiving an acknowledgment back through the Control Port, the client application sends the command **Next File Uptransfer** through the Control port which will generate a response of a binary data segment through the instrument's Data Port. After the last segment has been received through the Data Port, the client application sends the **End File Uptransfer** command through the Control Port. Once the acknowledgment is received through the Control Port, another file transfer may begin. After all files have been uploaded, the client application sends the **Close DataPort** command through the Control Port, the client application through the Control Port, the client application sends the **Close DataPort** command through the Control Port. Upon receiving acknowledgment back through the Control Port, the client application sends the **Close DataPort** command through the Control Port. Upon receiving acknowledgment back through the Control Port, the client application sends the **Close DataPort** command through the Control Port. Upon receiving acknowledgment back through the Control Port, the client application sends the **Close DataPort** command through the Control Port. Upon receiving acknowledgment back through the Control Port, the client application must close the data port connection.

Uploading Captured Data from a Channel

The commands described in this section are related to uploading binary capture data from the instrument. Text commands are sent through the control port and binary data is sent through the data port. Each binary data sample is contained in a 16-bit word for I (In-Phase component) followed by a 16-bit word for Q (Quadrature component). There are 4096 I/Q pairs, for a total data capture size of 16,384 bytes.

Beginning the Capture Upload

Syntax:

```
Begin Capture Uptransfer <channel>
```

Function:

Informs the instrument that uploading capture data will begin.

Returns:

Nak: <error message>

or

Ack: Capture Uptransfer Beginning

Where:

<error message> Descriptive text describing cause of error
<channel> CH1/CH2/CH3/CH4

Notes:

• The **Begin Capture Uptransfer** command is sent through the control port of the instrument, and the acknowledgement or Nak comes through the control port.

Receiving Binary Capture Data

Syntax:

Next Capture Uptransfer

Function:

Binary data segments are sent through the data port of the instrument.

Returns:

Nak: <error message>

or

[binary data]

Where:

<error message> Descriptive text describing cause of error

Notes:

- The binary data is sent through the data port as the acknowledgement or the Nak comes through the control port.
- The binary data size for each segment is limited to 8192 bytes.

Ending the Capture Upload

Syntax:

End Capture Uptransfer <channel>

Function:

Informs the instrument that uploading has ended normally.

Returns:

Nak: <error message>

or

Ack: Capture Uptransfer Ending

Where:

```
<error message> Descriptive text describing cause of error
<channel> CH1/CH2/CH3/CH4
```

Notes:

- The **End Capture Uptransfer** command is sent through the control port of the instrument, and the acknowledgement or Nak comes through the control port.
- Once the acknowledgment is received, another channel capture transfer may begin.
- The total data capture size expected by the upload is 16,384 bytes.

Aborting the Capture Upload

Syntax:

```
Abort Capture Uptransfer <channel>
```

Function:

Informs the instrument that uploading is terminating before completion.

Returns:

Nak: <error message>

or

Ack: Capture Uptransfer Aborting

Where:

<error message=""></error>	Descriptive text describing cause of error
<channel></channel>	CH1/CH2/CH3/CH4

Notes:

• The **Abort Capture Uptransfer** command is sent through the control port of the instrument, and the acknowledgement or Nak comes through the control port.

Capture Upload Protocol Example

The protocol (Figure 3) for uploading captured data for a channel begins with the client application sending the **Open DataPort** command to the instrument's Control Port. Upon receiving acknowledgment back from the Control Port, the client application

opens and connects to the Data Port of the instrument. Upon successfully connecting to the Data Port, the client application then sends the **Begin Capture Uptransfer** command through the instrument's Control Port. Upon receiving an acknowledgment back through the Control Port, the client application sends the command **Next Capture Uptransfer** through the Control port, which will generate a response of a binary data segment through the instrument's Data Port. After the last segment has been received through the Data Port, another channel capture transfer may begin. After uploading all captured data, the client application sends the **End Capture Uptransfer** command through the Control Port. Once the acknowledgment is received through the Control Port, the client application sends the **Close DataPort** command through the Control Port. Upon receiving acknowledgment back through the Control Port, the client application must close the data port connection.

Uploading Dynamic File Directory List

The commands described in this section are related to uploading the list of dynamic data files that are stored on the instrument. Text commands are sent to and received through the control port.

Beginning the Directory List Upload

```
Syntax:
```

Begin File Directory

Function:

Informs the instrument that uploading the directory list will begin.

Returns:

Nak: <error message>

or

Ack: File Directory Beginning

Where:

<error message> Descriptive text describing cause of error

Receiving a Directory Item

Syntax:

Next File DirItem

Function:

Dynamic filenames are sent from the control port of the instrument.

Returns:

Nak: <error message>

or

Ack: File DirItem <filename>

Where:

<error message> Descriptive text describing cause of error

<filename> Filename Ending the Directory List Upload Syntax: End File Directory Function: Informs the instrument that uploading has ended normally. Returns: Nak: <error message> or Ack: File Directory Ending Where: <error message> Descriptive text describing cause of error

Uploading Directory Protocol Example

The protocol (Figure 4) for uploading the directory of dynamic filenames begins with the client application sending the **Begin file Directory** command through the instrument's Control Port. Upon receiving an acknowledgment back through the Control Port, the client application sends the command **Next File DirItem** through the Control port which will generate a response of a filename through the instrument's Control Port. After the last filename has been received through the Control Port, the client application sends the **End File Directory** command through the Control Port. See **Getting the File Count** for more information about obtaining the total number of files stored on the instrument.



Figure 1: File Download Protocol



Figure 2: File Upload Protocol





Figure 3: Capture Upload Protocol

Figure 4: Uploading File Directory Protocol

CLIENT APPLICATION FEATURES

This section outlines the features provided by *AceClient*, the advantages for customizing the user interface for different engineering objectives, and the computer requirements to run the software.

Summary of User Interface

AceClient provides an interface for ACE9600 test equipment that allows the user to customize the client layout according to individual preferences:

Multiple ACE control: A single *AceClient* application has the ability to communicate with a list of different ACE9600s, with the option to link the entire list for actions such as connecting, disconnecting, starting, pausing, resetting and stepping forward/back.

Save/Load Configuration: Custom configurations can be saved under a user-supplied filename. When loaded, the file will restore the list of ACE connections, all parameter settings, graph selections and connection states.

Customizable View Tabs: Individual users can manage which of the nine views appear on the screen during the current session. View preferences are saved between application executions in the Windows INI file system or by saving the entire configuration under a user-supplied filename.

Upload Preferences: Uploading dynamic data files from a connected ACE can be done manually through a file manager or automatically as each file is selected for a particular dynamic data parameter. In addition, local copies of the files can be used instead of requesting an upload from the ACE9600.

Store/Recall Settings: The Store/Recall capability available on the instrument's front panel is accessible from the client. Recalling a previously saved setting is faster compared to loading a saved configuration, which requires each parameter to be separately sent to the device.

Diverse Targeted Engineering Applications

The client application allows for customized views and preferences, depending on the engineering objective:

RF Engineers can take advantage of the Channel Summary, Link Parameter Summary and Multipath Parameter Summary views, which allows testing a system at a single "snapshot" in time and observing the change in spectrum from transmitter to receiver.

Communications Engineers will benefit from the dynamic data displayed on the Dynamic Overview, Graphs and Capture views of various communications links in a scenario.

Project Managers can setup multiple instrument settings and downloads, and then start running an entire scenario from start to finish.

Operating System Requirements

AceClient is designed to run on the Windows[®] operating system and uses standard controls to display and update parameters. The following requirements should be met to ensure optimal performance:

Screen Size: The client application window is a fixed size of 1278x995 pixels, therefore the monitor used to display the application should be large enough to display the entire area. If a smaller screen size is detected, scrollbars will allow access to all portions of the user interface.

Operating System: This is a PC based desktop application, and requires the following minimum configuration:

- Windows[®] XP or Windows[®] 7 operating system
- 512 MB RAM, 20 MB hard disk space

Other accessories: Other computer accessories needed include a keyboard and a two button mouse, laptop touch pad, or pen.

USING THE CLIENT APPLICATION

This section provides a detailed description of the client application's main window components, which includes the Control Bar, the Tabbed Views, and Editing the User Configuration.

Control Bar

The control bar appears on the right side of the client window. The top of the bar displays a Connection Panel that lists ACEs for the current configuration and their connection state. The middle of the bar contains the Static or Dynamic Panel, depending on the mode selected. The bottom of the bar has buttons to invoke dialogs to save the current configuration or load a previous configuration, as well as a control to allow an exit from the program.

Connection Panel

The Connection Panel appears in the upper right corner of the client window (Figure 5 and Figure 6).



Figure 5: Panel with IP Addresses

Figure 6: Panel with Instrument Names

Under the title "Interface Name", a list box contains either a descriptive name or an IP address of each instrument added to the current configuration. To add/remove items to the list or to change whether the name or IP address is displayed, see

Add/Remove Interface Property.

A button below the list box allows the user to connect or disconnect the currently selected ACE. The connect state also appears in a status box under the title "Interface Status". When connected, the version number, serial number, and model of the currently selected ACE will be displayed below the status.

The currently selected ACE will be highlighted with a contrasting background, and a check to the left indicates whether or not the client is currently connected to the device.

If the ACE is placed in the local mode via the instrument's front panel display, the client interface will be disabled until the "Return to Remote" button is pushed (Figure 7).



Figure 7: Panel in Local Mode

Double clicking with the left mouse button on a list box item invokes a dialog box that allows the connection information for that instrument to be changed (Figure 8).

dBm	Advanced Channel Emulator
	Edit ACE Connect Information
	New Interface IP New Interface Name: 192.168.1.118 ACE_1
	New Control Port #: New Data Port #: 5555 5556
	OK Cancel

Figure 8: Edit Interface Dialog

Enter the new IP address, descriptive name, control port number and data port number in the edit boxes. Press the "OK" button to validate the connection settings and or the "Cancel" button to leave the settings unchanged.

Please note that the connection information can only be changed when the instrument is disconnected from the ACE

Static and Dynamic Panels

The Static Panel or Dynamic Panel appears in the middle right section of the client window (Figure 9 and Figure 10).

	Mode
	Dynamic
Mode	Dynamic Setup
Static 💌	Trigger Internal
Set Eb/No	, Update
	Internal
	Update Rate (msec)
Store Settings	1
1 2 3 4	RF Interval (msec)
5 6 7 8	1000
	MPath Interval (msec)
Freset	1000
	Loop
Recall Settings	Single
	Multi Chassis Sync
1 2 3 4	StandAlone
5 6 7 8	Start Time (sec)
Preset	0
	Elapsed Time (sec)
Default	0.000

Figure 9: Static Panel

Figure 10: Dynamic Panel

Under the title "Mode", the mode of the currently selected interface appears in a drop list box. The mode can be changed to either Static or Dynamic mode if the control is enabled. Changing the mode will alter which panel is displayed in the area, as well as enable or disable other controls on the tabbed view.

In the Static Mode, the panel will contain a "Set Eb/No" button, as well as allow previously saved settings from the device to be recalled or allow the current settings to be stored.

In the Dynamic Mode, the panel contains a "Dynamic Setup..." button, controls to run a dynamic data file, and current dynamic parameter settings in status boxes.

The buttons to control a run through the dynamic data files appear as media-type play controls, including from left to right: Reset, StepBack, Play, Pause, and StepFwd. The current run State in the Dynamic Mode is displayed directly under these control buttons.

Pressing the "Dynamic Setup..." button invokes the Dynamic Run Setup dialog, which allows changes to the dynamic settings, as well as allowing for parameter file selection. Once the dialog closes, the ACE is ready to start the dynamic run (Figure 11).

Run Set	tup							j
Dynamic F	Run Settings							
	Trigger		date	Loop		Step Forward/Back Size (nsec):	
	Internal	Internal	-	Single	•	1		
	Update Rate (msec)	RF In	iterval	Multipath Ir	nterval	Start Time (sec)	Multi Chassis Sync	
	1	1000	•	1000	•	0	StandAlone	
Channel 1	1 File Selections		Attenuatio	an Filo	From	anny Officiat File	Disase Officiat File	
	Delay File	ī	Attenuation		Frequ	ency offset File	Phase Offset File	
		l	AIN393K.ACE		INONE	<u> </u>	NONE	
	RF IN File	T	RF Out	rie	Lucure N	IOISE IND FILE	Multipath File	
	NONE	1	INONE	_	INONE	<u> </u>	NONE	
Channel								
Channel 2	Delay File		Attenuatio	on File	Frequ	ency Offset File	Phase Offset File	
	DLY10K.ACE	1	NONE	-	NONE	- -	NONE	
	, RE In File		, RE Out	File	,	loise No File	, Multipath File	
	NONE	1	NONE	-	NONE	•	NONE	
			,		,		,	
Channel 3	3 File Selections							
	Delay File		Attenuatio	on File	Frequ	ency Offset File	Phase Offset File	
	NONE]	NONE	-	NONE	•	NONE	
	RF In File		RF Out	File	Ν	loise No File	Multipath File	
	NONE]	NONE	-	NONE	•	NONE	
Channel 4	File Selections							
	Delay File		Attenuatio	on File	Frequ	ency Offset File	Phase Offset File	
	NONE		NONE	-	NONE	-	NONE	
	RF In File		RF Out	File	N	loise No File	Multipath File	
	NONE		NONE	•	NONE	•	NONE	
							OK	Ca

Figure 11: Dynamic Run Setup Dialog

Configuration Buttons

The "Load Config...", "Save Config...", and "Preferences..." buttons appear below the Static or Dynamic Panel on the right side of the client window (Figure 12).

Load Config
Save Config
Preferences

Figure 12: Load/Save Config Buttons

Pressing the "Load Config..." button will invoke a standard file dialog box to obtain the name of the previously saved configuration file. Navigate to the directory of the file and press the "Open" button to begin the load process.

Please note that loading a saved configuration will replace the current configuration completely and automatically connect to any ACE IP addresses that had been saved when connected.

A log of the commands executed during the loading of a configuration and any errors that occur will appear on the Activity Log View. See **Tab Views Property** for instructions to add the Activity Log to the tabbed views.

During the loading process, the progress in terms of percent completed will appear in the Interface Status display (Figure 13) and the "Load Config..." button changes text to "Cancel Load". The loading process can be canceled by pressing the "Cancel Load" button.

×	
Interface Name	
192.168.1.119	
▶ 192.168.1.118	
Disconnect	
Interface Status	
Loading 13%	

Figure 13: Load Percent Complete

Pressing the "Save Config..." button will invoke a standard file dialog box to obtain the name of the file in which to save all of the current configuration settings. Navigate to the directory of the file and press the "Save" button to begin.

Please note that the saved settings include all parameter settings, client preferences, graph settings and connection states, whereas the INI file system only saves client preferences.

Pressing the "Preferences..." button will invoke a property dialog to change the configuration settings. See **Editing the User Configuration** for more information about this dialog.

Exit Button and Scrolling

The "Exit" button and resize handle are located at the bottom right side of the client window (Figure 14).





Figure 14: Exit Button

Pressing the "Exit" button will close all open socket connections and save the client preferences in the Windows INI file system that will be restored the next time the program is executed.

Please note that the main client window is resizable. Drag the edges of the window to resize the client, or use the resize handle to the lower right of the "Exit" button. If a screen size smaller than the client window is detected, horizontal and vertical scrollbars will appear to allow access the all controls.

The program can also be closed by clicking the "dBm" icon in the upper, left corner of the title bar with the left mouse button and selecting "Close" (Figure 15).



Figure 15: System Menu Minimize, Maximum and Close

Alternatively, the program can be closed by clicking the "X" cancel button in the upper, right corner of the title bar (Figure 16).



Figure 16: Minimize, Maximize and Close Buttons

Tabbed Views

A tab control on the left side of the client window is used to display preferred views. See **Tab Views Property** for instructions about how to add views to the tab control.

Programmer's Manual

Channel Summary Tab

The Channel Summary tab displays all Static mode Link Parameters, AWGN Parameters, and Multipath Parameters for a given channel, as well as the Dynamic mode file selections for that channel (Figure 17). An overflow indicator for the Signal Power measurement is represented by a red LED icon next to the display.

(Bm ACE Remote Control 8.7										<u>_ ×</u>
Channel Summary			Step Size Details	1	Dynar	nic Overview	Í	File Mana	iger	Interface Name
Channel Selection Dynamic C Channel 1 C Channel 2 C Channel 3 C Channel 4	File Selections Delay File NONE RF In File NONE		A	Atten File TN393K.ACE RF Out File NONE	1	Freq Offset File NONE Noise No File NONE		Phase O NON Multipat	ffset E hFile E	ACE_1 Disconnect Interface Status Connected
Link Parameters Delay (msec)	Atten (dB)	- -	Freq Offset (kHz)	Phase Offse	et (deg)	RF In (MHz) 25 ×	RF Out (MH	z) Sigr	nal Power (dBm) -29.32	Version: 0.123.456 SN: 1216-008-00000 Model: ACE9600-4-1125
AWGN Parameters Ratio (dB) 0.00	BR (MHz)	-	No (dBm/Hz) 89.32	Noise M EbNo	ode On	Noise Enable	Calibration Sta Calculated	atus F	Range Status InRange	Mode Static 💌
				🕅 Enable Mult	ipath Functionality					Set Eb/No
Path Type Do 1 Off I 2 Off I 3 Off I 4 Off I 5 Off I 6 Off I 7 Off I 9 Off I 10 Off I		Loss (dBm) 0.0 4 0.0	Delay (usec) 0.000 at 0.000 at 0.	AoA (deg)	KFactor (dB)	Path Path V Path V Path2 V Path2 V Path3 V Path4 V Path5 V Path5 V Path6 V Path7 V Path7 V Path9 V	Value (%) 0 4 0 4 4 0 4 4 0 4 4 0 4 4 0 4 4 0 4 4 0 4 4 0 4 4 0 4 4 0 4 4 0 4 4 0 4 4 0 4 4 0 4 4 0 4 4 0 4 4 0 4 4 0 4 4 0 4 4	Rate (+z) Rate (+z) 0 24 0 24 0 0 0 0 0 0 0 0 0 0 0 0 0		Store Settings 1 2 3 4 5 6 7 8 Preset Recall Settings 1 2 3 4 5 6 7 8 Preset 1 2 3 4 5 6 7 8 Preset Default Default 1 1 1 1 2 3 4
11 Off V 0 12 Off V 0		0.0	0.000	45 7		Path11 V	0			Load Config Save Config Preferences Exit

Figure 17: Channel Summary Tab

The currently selected channel is displayed with radio-type buttons on the top left of the tab. To view the summary of parameters for a different channel, click on the corresponding radio button next to the channel name.

The file selections for the channel appear in read-only boxes to the side of the channel buttons.

Please note that changes to Dynamic mode file selections must be made by pressing the "Dynamic Setup..." button to invoke the Dynamic Run Setup dialog. See **Static and Dynamic Panels** for more information about the Dynamic Run Setup dialog.

Each Static mode parameter is displayed by an edit box, a drop list box of choices, or as a ready-only status box. Clicking the up/down buttons next to the edit box will increment or decrement the values by amounts that were set on the Step Size Details tab. See **Step Size Details Tab** for information about changing step values. Alternatively, a new parameter value can be entered using the keyboard, followed by the "Enter" key.

Please note that when the Delay value is changed, the delay control will be disabled until the ACE has completed slewing.

A check box at the top of the Multipath Parameters section allows for the entire multipath function to be disable by un-checking the box. This has the same effect as turning all of the paths off, but allows for the paths to be returned to their original settings by simply checking the box.

Please note that AWGN and Multipath parameter controls will be disabled if the corresponding license is invalid. All controls will be disabled if the channel board is not present.

Step Size Details Tab

The Step Size Details tab displays the size and units for incrementing or decrementing Static parameters, as well as the Max Delay Change with Slewing Enabled (Figure 18).

ACE Remote Control 8.7									_0 >
Channel Summary		Step Size D	Details	Dynamic Over	rview	1	File Manager]	Interface Name
									ACE_1
Channel 1 Static Parameter Step Size									
Delay	1 .	times	1msec 💌	RF In / RF Out:	1 *	times	1 MHz 💌		
Atten		timer	0.1d8 💌	Noise Eb/No:		timer	1 dB		Disconnect
5		inco [1 445	Noise Espirar		the second			Interface Status
Freq Uttset		times j	1 1 1 2	Noise BR		times	1002		Connected
Phase Offset	1	times	1 deg 💌	Noise No	1	times	1 dBm/Hz		
									Version: 0.123.456 SN: 1216-008-00000
Channel 2 Static Parameter Step Size									Model: ACE9600-4-1125
Delay	1 *	times	1 msec 💌	RF In / RF Out:	1 *	times	1 MHz 💌		
Atten	1 *	times	0.1dB	Noise Eb/No:	1 *	times	1 dB		
Freq Offset		times	1 kHz 🔻	Noise RP		times	1 MHz V		
Dhave Office		6	1 deg	Noise No		times	1 dBm/Hz		Mode
Phase Onset	- <u>-</u>	umes j	Today	Noise No	-	umes	1 dom/12		Stabc
									Set Eb/No
Channel 3 Static Parameter Step Size									
Delay	1 *	times	1 msec 💌	RF In / RF Out:	1 *	times	1 MHz 💌		Store Settings
Atten	1 *	times	0.1 dB 💌	Noise Eb/No:	1 *	times	1 dB 💌		1 2 3 4
Freq Offset	1 *	times	1 kHz 💌	Noise BR	1 *	times	1 MHz 💌		5 6 7 8
Phase Offset		times	1 deg 👻	Noise No		times	1 dBm/Hz		Preset
							,		
Channel 4 Static Parameter Step Size		_							Recall Settings
Delay	1 *	times	1 msec 💌	RF In / RF Out:	1	times	1 MHz 💌		1 2 3 4
Atten	1 .	times	0.1 dB 💌	Noise Eb/No:	1 .	times	1 dB		5 6 7 8
Freq Offset	1 *	times	1 kHz 💌	Noise BR	1 *	times	1 MHz 💌		Preset
Phase Offset	1	times	1 deg 💌	Noise No	1	times	1 dBm/Hz 💌		Default
Max Delay Change with Slewing Enable	ed								
Delay Slew Boundary									
Delay alew boundary: 10.000	msec								Load Config
									Save Config
									Dreferences
									Ficiciences
						_			Exit

Figure 18: Details Tab

Step Sizes for Static mode parameters are displayed by an edit box, along with a drop list box of unit choices for Step Sizes. Clicking the up/down buttons next to the edit box will increase or decrease the Step Sizes set up by 1. Alternatively, a new Step Size value can be entered using the keyboard, followed by the "Enter" key.

The value for the Delay Slew Boundary is displayed by an edit box, along with the assumed units of msec. Clicking the up/down buttons next to the edit box will increase or decrease the Delay Slew Boundary by 1. Alternatively, a new Delay Slew Boundary value can be entered using the keyboard, followed by the "Enter" key.

Dynamic Overview Tab

The Dynamic Overview tab displays all the dynamic data parameters and selected graphs on a single page (Figure 19).

dBm ACE Remote	Control 8.7												<u>_ </u>
	Channel Summary		Step Size Details		(Oynamic Overvi	ew			File I	Manager		Interface Name
	Delay (msec)	Atten (dB)	Freq Offset (kHz)	Phase (Offset (deg)	R	F In (MHz)		RF Ou	t (MHz)	No (dBm/Hz)	ACE_1
Channel 1	0.1000000	0.0	1.00000		1.0		1125		11	25	4	39.32	
			Path	Doppler (Hz)	Loss (dBm)	Delay (usec)	AoA (deg)	Path	Doppler (Hz)	Loss (dBm)	Delay (usec)	AoA (deg)	
Ma	70.0 / / / /		1 1	0	0.0	0.000	45	7	0	0.0	0.000	45	Disconnect
			A (2	0	0.0	0.000	45	8	0	0.0	0.000	45	Teterface Status
C	Surrent:		<u>М</u> (Д. 3)	0	0.0	0.000	45	9	0	0.0	0.000	45	Connected
		M M N N M M M	} 4	0	0.0	0.000	45	10	0	0.0	0.000	45	
			5	0	0.0	0.000	45	11	0	0.0	0.000	45	
Mi	nimum:		<u> </u>	0	0.0	0.000	45	12	0	0.0	0.000	45	Version: 0.123.456 SN: 1216-008-00000
-								J					Model: ACE9600-4-1125
Channel D	Delay (msec)	Atten (dB)	Freq Offset (kHz)	Phase (Offset (deg)	R	F In (MHz)	1	RF Ou	t (MHz)	No (dBm/Hz)	Mada
Channel 2	0.100000	0.0	0.00000		0.0		1125			.25		.00.00	Dynamic
Ma 200.00000	ximum:		Path	Doppler (Hz)	Loss (dBm)	Delay (usec)	AoA (deg)	Path	Doppler (Hz)	Loss (dBm)	Delay (usec)	AoA (deg)	
700.00000			1		0.0	0.000	45	7	0	0.0	0.000	45	Ready
C			2		0.0	0.000	45	8	0	0.0	0.000	45	Dynamic Setup
0.10000	msec		3	0	0.0	0.000	45	9	0	0.0	0.000	45	Triana
			4	0	0.0	0.000	45	10	0	0.0	0.000	45	Internal
Mi	nimum:		5	0	0.0	0.000	45	11	0	0.0	0.000	45	Lindate
0.007.00	,00000		6	0	0.0	0.000	45	12	0	0.0	0.000	45	Internal
	Delay (msec)	Atten (dB)	Freq Offset (kHz)	Phase (Offset (deg)	R	F In (MHz)		RF Ou	t (MHz)	No (dBm/Hz)	Jundata Data (mara)
Channel 3	2.000000	0.0	0.00000		0.0		1125		11	.25	-1	.00.00	1
Ma	ximum:		Path	Doppler (Hz)	Loss (dBm)	Delay (usec)	AoA (deg)	Path	Doppler (Hz)	Loss (dBm)	Delay (usec)	AoA (deg)	PE Interval (meac)
700.00000	00000		1	0	0.0	0.000	45	7	0	0.0	0.000	45	1000
r			2	0	0.0	0.000	45	8	0	0.0	0.000	45	1
2.0000	000000		3	0	0.0	0.000	45	9	0	0.0	0.000	45	MPath Interval (msec)
			4	0	0.0	0.000	45	10	0	0.0	0.000	45	1000
Mi			5	0	0.0	0.000	45	11	0	0.0	0.000	45	Single
0.00700	000000		6	0	0.0	0.000	45	12	0	0.0	0.000	45	Joingie
	Delay (msec)	Atten (dB)	Freq Offset (kHz)	Phase (Offset (deg)	R	F In (MHz)		RF Ou	t (MHz)	No (dBm/Hz)	StandAlone
Channel 4	2.000000	0.0	0.00000		0.0		1125		11	.25	-1	.00.00	Chart True (con)
Ма	simum:		Path	Donnler (Hz)	Loss (dBm)	Delay (usec)	AoA (dea)	Path	Doppler (Hz)	Loss (dBm)	Delay (usec)	AoA (dea)	0
700.00000			1	NA	NA	NA	NA	7	NA	NA	NA	NA	
			2	NA	NA	NA	NA	8	NA	NA	NA	NA	Elapsed Time (sec)
2.00000	00000		3	NA	NA	NA	NA	9	NA	NA	NA	NA	
			4	NA	NA	NA	NA	10	NA	NA	NA	NA	
Mit			5	NA	NA	NA	NA	11	NA	NA	NA	NA	Load Config
0.00700	000000		6	NA	NA	NA	NA	12	NA	NA	NA	NA	Save Config
* * * Double-die	ck on a graph to expand the pl	lot in a floating window	Zoom In										Preferences
		-											Exit
-													

Figure 19: Dynamic Overview Tab

Current parameter values are displayed on two-state buttons. If no dynamic file has been selected for the parameter, the Static mode value is displayed.

Pressing a parameter button will display the graph for the dynamic data file that has been selected. For more information about uploading a data file, see

File Manager Tab.

File Manager Tab

The File Manager tab displays a list all files downloaded to ACE as well as a graph of the selected dynamic file (Figure 20).

Channel Summary		Í	Sten Size Details	í		Dynamic Overview	1	File Manager	Interface
Channel Summary			Step Size Details			Dynamic Overview		, includinger	
									MACE_1
		Download Files fro	m PC to ACE	Delete Selecte	ed Files from A	CE Upload	Selected Files from ACE to PC		
	_								
				Delete	a All Files				Diama
			-						Disconr
									Interface
									Connec
									Version: 0.1
									Model: ACE96
File Count: 37				* * * To de	elete or upload	files on the ACE, sel	ect one or more files in the list box	below using Ctrl- or Shift-dicks.	Mod
File Name	File Type	Status	Number of Samples	Continuous	Uploaded	File Size (bytes)	Time Stamp		Dynamic
DLY4.ACE	Delay	NOT_IN_USE	4	YES	NO	520	2017-03-07_10:51:54		
DLYMAX.ACE	Delay	NOT_IN_USE	1000000	NO	NO	2000512	2017-02-09_10:16:29		
FRQ_TX1.ACE	FreqOffset	NOT_IN_USE	86400	NO	NO	173312	2017-02-14_10:47:17		Read
FRQ1.ACE FRO1ACE1 ACE	FreqUffset	NOT_IN_USE	3 601	NO	NO	518	2017-02-14_12:15:23 2017-05-25_04:30:11		Dynamic
FRO393K.ACE	FreqOffset	NOT IN USE	393217	NO	NO	786946	2016-11-30 10:21:03		Trice
FRQDS.ACE	FreqOffset	NOT_IN_USE	10000	NO	NO	20512	2017-02-28_14:24:28		Ingg
FRQLORES.ACE	FreqOffset	NOT_IN_USE	420470	NO	NO	841452	2017-05-21_16:16:34		Internal
MPF3.ACE	Mpf	NOT_IN_USE	3	NO	NO	800	2017-03-02_10:34:39		Upda
MPE30C.ACE	Mof	NOT_IN_USE	30	TES NO	NO NO	3392	2017-03-02_12:13:13 2017-03-02_12:13:10		Internal
MPF39321.ACE	Mpf	NOT_IN_USE	39321	NO	NO	3775328	2016-11-30_14:46:41		Januarilai
MPF39KT.ACE	Mpf	NOT_IN_USE	39321	NO	NO	3775328	2016-11-30_14:22:40		Update Rat
PHA393K.ACE	PhaseOffset	NOT_IN_USE	393217	NO	NO	786946	2016-11-30_10:19:42	•	1
									DC Internet
									RF interva
Maximum:									1000
359.90		lliil	1	للبيبالا		lt.illt.			MPath Interv
									1000
									1000
		1831418			ورورواورو				
Current:						A A A A A A A A A A A A A A A A A A A	LANNALANALA	* * * * * * * * * * * * * * * * * * * *	Loop
Current: 0.00									Loop
Current: 0.00									Loop
Current: 0.00									Looj Single Multi Chass
Current: 0.00									Loop Single Multi Chass StandAlon
Current: 0.00 Position:									Loo Single Multi Chass StandAlon
Current: 0.00 Position: 0									Loop Single Multi Chass StandAlon Start Time
Current: 0.00 Position: 0									Loo Single Multi Chass StandAlon Start Time 0
Current: 0.00 Position: 0									Looj Single Multi Chas: StandAlon Start Time 0 Elapsed Tin
Current: 0.00 Position: 0 Minimum:									Loo Single Multi Chass StantAlon Start Time D Elapsed Tim 0.000
Current: 0.00 Position: 0 Minimum: 0.00									Looj Single Multi Chass StandAlon Start Time D Elapsed Tin 0.000
Current: 0.00 Position: 0 Minimum: 0									Loo Single Multi Chas: StandAlon Start Time 0 Elapsed Tin 0.000
Current: 0.00 Position: 0 Minimum: 0.00	Cursor Left			Scroll: ON	OFF			Cursor Right	Looj Single Multi Chas: StantAlon Start Time 0 Elapsed Tin 0.000
Current: 0.00 Position: 0 Minimum: 0.00	Cursor Left			Scroll: ON	OFF			Cursor Right	Loop Single Multi Chass StandAlon Start Time Bapsed Tin 0.000 Load Co
Current: 0.00 Position: 0 Minimum: 0.00	Cursor Left			Scroll: ON	OFF			Cursor Right	Loop Single Multi Chass StandAlon Start Time Elapsed Tim 0.000 Load Col Save Col
Current: 0.00 Position: 0 Minimum: 0.00	Cursor Left			Scroll: ON	OFF	2		Cursor Right	Loo Single Multi Chass Stant Alon Start Time D Elapsed Tin D 000 Load Coo Save Coo
Current: 0.00 Position: 0 Minimum: 0.00	Cursor Left			Scroll: ON	OFF	3		Cursor Right	Loo Single Multi Chass StantAhon Start Time D Elapsed Tim 0.000 Load Cor Save Cor Preferen
Current: 0.00 Position: 0 Minimum: 0.00	Cursor Left			Scroll: ON	OFF			Cursor Right	Loo Single Multi Chass StandAlom Start Time 0 Elapsed Tim 0.000 Load Cor Save Cor Preferen Ext

Figure 20: File Manager Tab

When connected, a list box in the center of the tab contains the file information for each file found on the selected instrument. The columns of the list box contain the preamble information that was saved during the file conversion process. The list also indicates if the file has been uploaded to the client for graphing or is currently being used by one or more channels.

A graph displays the currently selected file from the list if the dynamic data has been uploaded. The graph operates in one of two modes: compact viewing of the entire data set or detail viewing of each data sample. A scroll bar is attached to the detail view so that long data files can be examined. Press the Scroll "On"/"Off" button to toggle between graph viewing modes.

A red vertical cursor is located at the currently selected data point under observation with the corresponding dynamic value displayed on the left side of the graph. Change the cursor position by clicking on the graph or by using the "Cursor Left"/"Cursor Right" buttons.

Files can be deleted, uploaded or downloaded by pressing the buttons above the file list box. A status area is displayed while communicating with the ACE for these file tasks (Figure 21).

Cancel	Files Remaining:	1
Current File Status:	dly10k.dat	
Downloading dly10k.ace		
Percent Completed:		
33%	1	

Figure 21: File Task Status

To delete one or more files, select the file name while holding down the keyboard "Ctrl" button, and then press the "Delete Selected Files" button. To delete all of the files, press the "Delete All Files" button. A message box will appear to confirm that all files will be deleted.

To upload one or more files from the ACE to the *AceClient*, select the file name while holding down the keyboard "Ctrl" button, and then press the "Upload Selected Files" button. To change the preferences to automatically upload any file that has been selected for a channel instead of manually uploading, see **Options Property**.

To download one or more files to the currently selected ACE, press the "Download File..." button to invoke a file selection dialog box. Navigate to the directory where the files are located and select multiple files by holding the down keyboard "Ctrl" button, followed by pressing the "Open" button. See **Dynamic File Format** for more information about creating files for download. Open the ASCII text file under the name "download_log.txt" after downloading files to view a log of errors found in the file conversion process.

Link Parameter Summary Tab

The Link Parameter Summary tab displays all non-fading Static mode parameters and dynamic file selections on a single page (Figure 22).

IBm ACE Remote Control 8.7	_ <u> </u>
Channel Summary Step Size Details Dynamic Overview File Manager	Interface Name
Chine al anticial summary Graphs Activity Log	ACE_1
Link Delay (msec) Atten (d8) Freq Offset (dHz) Phase Offset (deg) RF In (MHz) RF Out (MHz) Signal Power (d8m) Jameters 0.1000000 a 0.0 a 1.0 a 1125 a 1125 a -34.40	Disconnect
AVICP. Ratio (dB) BR (M+t2) No (dBm/h2) No (dBm/h2) Noise Mode Noise Enable Calibration Status Range Status Parameters 0.00 + Calibration Status InRange	Interface Status Connected
Dynamic File Delay File Atten File Freq Offset File Phase Offset R.F. In File RF Out File None Multipath File Selections NONE ATN393K.ACE NONE NONE	Version: 0.123.456 SN: 1216-008-00000 Model: ACE9600-4-1125
Channel 2 Delay (msec) Atten (dB) Freq Offset (d+iz) Phase Offset (deg) RF In (M+rz) RF Out (M+rz) Signal Power (dBm) Link 0.1000000 0.0	
AWON Ratio (d8) BR (MHz) No (d8m,Hz) Noise Mode Noise Enable Calbration Status Range Status	Mode Static
Dynamic File Delay File Atten File Freq Offset File Phase Offset RF In File RF Out File Noise No File Multipath File Selections NORE NORE	Sectorivo
	Store Settings
Channel 3 Delay (msec) Atten (dB) Freq Offset (kHz) Phase Offset (deg) RF In (MHz) RF Out (MHz) Signal Power (dBm) Link 0.00000 0.0 </td <td>5 6 7 8 Preset</td>	5 6 7 8 Preset
AVICN Parameters Ratio (dB) BR (MHz) No (dBm/Hz) Noise Mode Noise Enable Calibration Status Range Status	Recall Settings
Dynamic File Delay File Atten File Freq Offset File Phase Offset RF In File RF Out File Noise No File Multipath File Selections NONE NONE	1 2 3 4 5 6 7 8
- Changel 4	Preset
Link Delay (msec) Atten (db) Freq Offset (bfz) Phase Offset (deg) RF In (hfz) RF Out (hfz) Signal Power (dbm) Parameters 2.000000 a 0.0 a 0.0 a 1125 a 1125 a 3440	Default
AWON Ratio (db) BR (M+tz) No (dbm/+tz) Noise Mode Noise Enable Calbration Status Range Status	
Dynamic File Delay File Atten File Freq Offset File Phase Offset RF In File RF Out File Noise No File Multipath File Selections NONE NONE NONE NONE NONE NO	Load Config Save Config
	Exit

Figure 22: Link Parameter Summary Tab

Channel parameters are displayed by an edit box, a drop list box of choices, or as a readonly status box.

Please note that when the Delay value is changed, the delay control will be disabled until the ACE has completed slewing.

Clicking the up/down buttons next to the edit box will increment or decrement the values set on the Step Size Details tab. See **Step Size Details Tab** for information about changing step values. Alternatively, a new parameter value can be entered using the keyboard, followed by the "Enter" key.

Please note that changes to the Dynamic mode file selections must be made by pressing the "Dynamic Setup..." button to invoke the Dynamic Run Setup dialog. See **Static and Dynamic Panels**Static and Dynamic Panel for more information about the Dynamic Run Setup dialog.

Multipath Parameter Summary Tab

The Multipath Parameter Summary tab displays fading parameters for six paths at a time on a single page (Figure 23).

dim ACE Remote Control 7.	3									×
Channel S	ummary	Step Size Details			Dynamic Overview		File Manager		Interface Name	
Link Paramete	er Summary	Multipath Parameter Summary			Graphs		Capture		✓ 192.168.1.118	
- Ch1			 Display Path 	n1 to Path6 C	Display Path7 to Pat	h12				192.168.1.119
Path Type 1 CW ¥ 2 Rice ¥ 3 Ray ¥ 4 Off ¥ 5 Off ¥ 6 Off ¥	Doppler (Hz) 0 4 0 4 0 4 0 4 0 4 0 4 0 4 0 4 0 4 0 4	Loss (dBm) 0.0 = = 0.0 = = 0.0 = = 0.0 = = 0.0 = = 0.0 = =	Delay (usec) 0.000 n 0.000 n	AoA (deg) 45 4 45 4 4 5 4 5 4 5 4 5 4 5 4 5 4 5	KFactor (dB)	Path1 Path2 Path2 Path3 Path3 Path4 Path4 Path5 Path6	Corr Value 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Log-I Rate (Hz) 0	Storbal Stot, Dev. 0 41 0 41 0 41 0 41 0 41 0 41 0 41	Disconnect Interface Status Connected Version: 0.122.455 SN: 117-101-00000 Model: ACE9600-4-1125
Ch2	Doppler (Hz)	Loss (dBm)	Delay (user)	404 (deg)	KEactor (dB)	Corre	elation	Log-l	Normal	
NA I 1 NA I 2 NA I 3 NA I 4 NA I 5 NA I	NA	NA 2 NA 2 NA 2 NA 2 NA 2 NA 2	NA C NA C NA C NA C NA C NA C	NA C	NA 2 NA 2 NA 2 NA 2 NA 2 NA 2	NA Y NA Y NA Y NA Y NA Y	NA C	NA P	NA C NA C NA C NA C NA C	Hode Static T Set: Eb/No
6 NA 💌	NA ×	NA 🗾	NA ×	NA Ir.	NA	NA	NA	NA ×	NA 💌	Store Settings
Ch3						Com	alation	100.1	lormal	5 6 7 8
Path Type 1 Off V 2 Off V	Doppler (Hz)	Loss (dBm) 0.0	Delay (usec) 0.000 + 0.000 + +	AoA (deg) 45 - 45	KFactor (dB)	Path Path1 V Path2 V	Corr Value 0	Rate (Hz)	Std. Dev.	Preset
3 Off ¥ 4 Off ¥ 5 Off ¥ 6 Off ¥		0.0 +	0.000 × 0.000 × 0.000 × 0.000 ×	45 7 45 7 45 7 45 7 45 7		Path3 V Path4 V Path5 V Path6 V				Recall Settings
c Ch4										Preset
Path Type 1 Off ¥ 2 Off ¥ 3 Off ¥ 4 Off ¥ 5 Off ¥ 6 Off ¥	Doppler (Hz) 0 ** 0 ** 0 ** 0 ** 0 ** 0 ** 0 ** 0 *	Loss (dBm) 0.0 = 0.0 = 0.0 = 1 0.0 = 1.0	Delay (usec) 0.000 - 0.000 - 0.000 - 0.000 - 0.000 - 0.000 - 0.000 - 0.000 - 0.000 - 0.000 -	AoA (deg) 45 - 45 - 45 - 45 - 45 - 45 - 45 - 45 - 45 - 45 -	KFactor (dB)	Path1 V Path1 V Path2 V Path3 V Path4 V Path5 V Path6 V	Corr Value 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	Rate (Hz) 0 a 0 a a 0 a a 0 a a 0 a a 0 a a 0 a a 0 a a 0 a a 0 a a 0 a a	tormal Std. Dev. 0 2 0 2 0 2 0 2 0 2 0 2 0 2 0 2	Load Config Save Config Preferences
										Exit

Figure 23: Summary Fading Tab

Two radio buttons appear at the top of the tab, allowing the user to view either the Paths 1-6 or Paths 7-12. Each fading parameter is represented by an edit box or a drop list box of choices.

Clicking the up/down buttons next to the edit box will increment or decrement the values by a fixed amount. Alternatively, a new parameter value can be entered using the keyboard, followed by the "Enter" key.



Graphs Tab

The Graphs tab allows for a customized display of selected graphs for dynamic data parameters on a single page (Figure 24).

dBm ACE Remote Control 8.7				
Channel Summary	Step Size Details	Dynamic Overview	File Manager	Interface Name
Link Parameter Summary	Multipath Parameter Summary	Graphs	Activity Log	ACE_1
Channel Parameter Ch1 Y Meeter Path Fading Parameter Path Pading Parameter Path State Pading Parameter Path Pading Parameter Path Path Pading Parameter Path Path Pading Parameter Path Path Path Path Path Path Path Path	Maximum 08 20:0 1 Current: 1 0:0 1 0:0 1 0:0 1 0:0 1 0:0 1 0:0 1 0:0 1 0:0 1 0:0 50000 100000	150000 200000 250000		Disconnect Interface Status Connected
Channel Parameter Ch1 Path Pading Parameter Path Doppler V No File Selected - Using State: Value	Select a Parameter Type to Display			Version: 0.123.456 SN: 1216-008-00000 Model: ACE9600-4-1125 Mode Dynamic V Ready
Channel Parameter Ch1 V NONE V Path Fading Parameter Doppler V No File Selected - Using Static Value V V V	Select a Parameter Type to Display			Dynamic Setup Trigger Internal Update Internal Undate Rate (msec)
Channel Parameter Ch1 V Path Fading Parameter Path1 V Doppler V No File Selected - Using Static Value	Select a Parameter Type to Display			Image: state
Channel Parameter Ch1 Image: Channel Image: Channel Path Fading Parameter Doppler Path Fading Parameter Image: Channel No File Selected - Using Static Value Value	Select a Parameter Type to Display			Single Multi Chassis Sync StandAlone Start Time (sec) 0 Elancert Time (sec)
Channel Parameter Ch1 Path Path Path Path No File Selected - Using Static Value	Select a Parameter Type to Display			Load Config Save Config
	* * * Double-click on a graph to expand the plot in a floating windo	w Zoom In		Exit

Figure 24: Graphs Tab

Each graph of uploaded data has an associated drop list box for selecting channel, parameter, path and fading parameter. If no dynamic file has been selected for the parameter, the Static mode value is graphed. Double-click on a graph to expand the plot in a floating window, or press the "Zoom In" button so that each sample in the file is displayed on the graph.

For more information about uploading file data, see

File Manager Tab.

Capture Tab

The Capture tab displays graphs of data that are sampled from the incoming signal to the instrument (Figure 25).

Please note that the controls for the Capture Tab are disabled when the device is operating in the Dynamic Mode.



Figure 25: Capture Tab

The currently selected channel appears as drop list box at the top of the display area. The capture options for the currently selected channel appear above the graphs. To change the capture options, press the "Capture Options..." button (Figure 26).

Capture Options			×
Capture Point			
Channel 1:	Before Impairment	C After Impairment	
Channel 2:	Before Impairment	C After Impairment	
Channel 3:	Before Impairment	C After Impairment	
Channel 4:	Before Impairment	C After Impairment	
Graph Scale	cale	Capture All Chappele	
C Auto Scale		Capture Air Channels	
	ОКС	ancel	

Figure 26: Capture Options Dialog

To capture samples of the input signal going into the ACE, press the "Start Capturing" at the top of the display area. If the "Capture All Channels" option is selected, the input signal from each channel will be captured. Otherwise, only the currently selected channel will be captured.

The input signal for the currently selected channel is displayed in four different graphs at the lower right of the tab. The I and Q components of the signal are displayed in the first two graphs.

The graph of the composite RMS representation of the signal appears in the third graph, along with the display of the Average RMS value computed from the sample set to the left of the graph.

The power spectrum of the signal is also computed and displayed in the bottom graph, with the peak frequency displayed to the left of the graph.

All captured graphs can be printed or saved by pressing the "Print" or "Save..buttons at the top right of the tab.



Activity Log Tab

The Activity Log tab displays the current settings of the selected ACE in text boxes, as well as text logs of communication between the *AceClient* to the ACE (Figure 27).



Figure 27: Activity Log Tab

All text boxes on the view have scrollbars to allow viewing long lists collected data.

Each text message from the client application to the ACE9600 has a corresponding response on either the control port or the data port.

Editing the User Configuration

The *AceClient* application can be customized for a variety of engineering applications by pressing the "Preferences..." button on the side Control Bar to invoke a property dialog.

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Please note that none of the changes made to the configuration will take effect until the Edit Configuration dialog box is closed with the "OK" button.

Add/Remove Interface Property

The Add/Remove Interface property allows for adding, removing, or re-ordering the list of instruments in the current configuration (Figure 28).

Preferences						×
	IP Address	Name	Control Port	Data Port	Format	Remove
Options	192.168.1.118	ACE_1	5555	5556	Text	Move Up
						Move Down
						Add New
						Eak
	- Dis	play on Main Vie	w by		k all instruments	sfor
	G	Name O II	P Address	Conne Play/P	ct/Disconnect a ause/Reset/Ind	and c/Dec
			016	1	. 1	
			ОК	Cance		

Figure 28: Add/Remove Interface Property

To add a new instrument to the configuration, press the "Add New..." button to invoke the "Add ACE Connect Information" dialog. Enter the IP address, descriptive name and port numbers in the edit boxes. Press the "OK" button to confirm the connection settings and add the new connection to the bottom of the list.

To remove an existing device in the configuration, select an item in the list and press the "Remove" button.

To move an existing device up or down in the list, select the item and press the "Move Up" or "Move Down" button until it is in the desired order.

To display either the descriptive name or IP address in the Control Bar connection list, click the corresponding radio button under the "Display on Main View by" title.

To connect the dynamic data run controls of all connected instruments, check the "Link all instruments" box.

Tab Views Property

The Tab Views property allows the selection of tabbed views shown on the main window tab control (Figure 29).

Preferences		×
	Check to show page on tab:	
	Channel Summary	
	✓ Step Size Details	
	V Dynamic Overview	
	✓ File Manager	
	☑ Link Parameter Summary	
	Multipath Parameter Summary	
	Graphs	
	Capture	
	Activity Log	
	OK Cancel	

Figure 29: Tab Views Property

To include a view on the main window tab control, click the check box next to the page name until a check appears.

- The Channel Summary tab displays all Static mode Link Parameters, AWGN Parameters, and Multipath Parameters for a given channel, as well as the Dynamic mode file selections for that channel. For more information about this tab, see **Channel Summary Tab.**
- The Step Size Details tab displays the size and units for incrementing or decrementing Static parameters, as well as the Max Delay Change with Slewing Enabled. For more information about this tab, see **Step Size Details Tab.**
- The Dynamic Overview tab displays all the dynamic data parameters and selected graphs on a single page. For more information about this tab, see


- **Dynamic Overview** Tab.
- The File Manager tab displays a list all files downloaded to ACE as well as a graph of selected dynamic file data. For more information about this tab, see

- File Manager Tab.
- The Link Parameter Summary tab displays all non-fading Static mode parameters and dynamic file selections on a single page. For more information about this tab, see



- Link Parameter Summary Tab.
- The Multipath Parameter Summary tab displays fading parameters for six paths at a time on a single page. For more information about this tab, see **Multipath Parameter Summary** Tab.
- The Graphs tab allows for a customized display of selected graphs for dynamic data parameters on a single page. For more information about this tab, see

- Graphs Tab.
- The Capture tab displays graphs of data that are sampled from the incoming signal to the instrument. For more information about this tab, see



- Capture Tab.
- The Activity Log tab displays the current settings of the selected ACE in text boxes, as well as text box logs of communication between the *AceClient* to instrument. For more information about this tab, see

• Activity Log Tab.

Options Property

The Options property allows changes to preferences for uploading files (Figure 30).

Preferences		×
Add/Remove Interface Tab Views <mark>Options</mark>		
	✓ Use Local Copy of File if Available	
	Save Upload Data to Local Computer	
	Automatically Upload Graphs When Selected	
	Save Preferences Between Sessions	
	OK Cancel	

Figure 30: Preferences Property

Please note that the saved settings by pressing the "Save Config..." button include all parameter settings, client preferences, graph settings and connection states, whereas the INI file system only saves client preferences.

To enable a particular option, check the box next to the option.

- Each dynamic data file that is converted and downloaded by *AceClient* will contain a unique timestamp identifier in the preamble. A local copy of the converted file is saved to the execution file directory. To use this local copy of the converted file when uploading graph data, check the "Use Local Copy of File if Available" box. If the unique timestamp of the file does not match the preamble of the file residing on the instrument or is not found locally, the file will be uploaded from the device.
- To save a copy of the file uploaded from the instrument on the local computer executing *AceClient*, check the "Save Upload Data to Local Computer" box. This may speed the upload process on subsequent executions of the client application.



• To automatically upload the dynamic data file when a file is selected on the tab views, check the "Automatically Upload Graphs When Selected" box. If this preference is not selected, then the File Manager tab must be used to manually upload dynamic data files for viewing. For more information about manual uploads, see

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- File Manager Tab.
- To save the preferences to the INI file system between sessions, check the "Save Preferences Between Sessions" box. If this preference is not selected, one ACE interface with default settings will be entered into the interface list. Also, four default tab views will be on display (Channel Summary, Step Size Details, Dynamic Overview, and File Manager).

Dynamic File Format

The ACE distinguishes parameter file types by the first three letters in each file name. File names can be up to 8 alphanumeric characters with the file extension of ".dat":

DLYxxxx.dat - designates a delay file FRQxxxx.dat - designates a frequency offset file ATNxxxx.dat - designates an attenuation file PHAxxxx.dat - designates a phase offset file RFFxxxx.dat - designates an RF frequency file WGNxxxx.dat - designates a noise density file MPFxxxxx.dat - designates a multipath fading file

Parameter data files must be generated in ASCII format. The first line in the file is a value that represents the number of sample points in the file. Delay and FreqOffset type files also have an optional resolution value. See **Delay Type File Format** and **Frequency Offset Type File Format** sections below for more information.

Each subsequent line will contain one data value, with lines separated by a carriage return. Multipath files have a different format. See the **Multipath Type File Format** section below for more information.

When the files are converted (optimized), the files have the same prefix, but the suffix becomes ".ACE". The converted files are then transferred over the LAN interface, and stored in flash memory. The converted files are in binary format (to optimize storage) with an ASCII header (so that information can be displayed on the front panel).

Delay Type File Format

Delay type filenames must begin with "DLY" and end with ".DAT". The first line in the file is a value that represents the number of sample points in the file. Delay type files also have an optional resolution value in msec which is separated by an ASCII space character from the number of sample points. If no resolution value exists in the data file, the assumed resolution is 0.0000001 msec (100 psec).

Valid resolutions in msec are :

- 0.0000001 (100 psec)
- 0.00000001 (10 psec)
- 0.000000001 (1 psec)
- 0.000000001 (0.1 psec)

The maximum delta Delay between samples is limited by the resolution value:

<u>Resolution in msec</u> 0.0000001 (100 psec) 0.00000001 (10 psec) 0.000000001 (1 psec)

<u>Maximum Delta</u> +/- 0.002000 msec +/- 0.00032767 msec +/- 0.000032767 msec 0.000000001 (0.1 psec) +/- 0.0000032767 msec Each subsequent line will contain one data value in the assumed units of msec, with lines separated by a carriage return. The maximum range for the data values is determined by the minimum and maximum delay of the instrument.

A sample data file containing three sample points with a resolution of 10 psec is as follows:

Frequency Offset Type File Format

Frequency Offset type filenames must begin with "FRQ" and end with ".DAT". The first line in the file is a value that represents the number of sample points in the file. Frequency Offset type files also have an optional resolution value in kHz which is separated by an ASCII space character from the number of sample points. If no resolution value exists in the data file, the assumed resolution is 0.001 kHz (1 Hz).

Valid resolutions in kHz are :

- 0.001 (1Hz)
- 0.0001 (10 mHz)

The maximum delta Frequency Offset between samples is limited by the resolution value:

Resolution in kHz	Maximum Delta
0.001 (1Hz)	+/- 32.767 kHz
0.0001 (10 mHz)	+/- 0.32767 kHz

Each subsequent line will contain one data value in the assumed units of kHz, with lines separated by a carriage return. The maximum range for the data values is determined by the minimum and maximum Frequency Offset of the instrument.

A sample data file containing three sample points with a resolution of 10 mHz is as follows:

3 0.00001 -4.659803 -4.659997 -4.660190

Phase Offset Type File Format

Phase Offset type filenames must begin with "PHA" and end with ".DAT". The first line in the file is a value that represents the number of sample points in the file. The assumed resolution is 0.1 degrees.

Each subsequent line will contain one data value in the assumed units of degrees, with lines separated by a carriage return. The maximum range for the data values is 0.0 to 359.9 degrees.

A sample data file containing three sample points with a resolution of 0.1 degree is as follows:

3 179.9 150.5 0.2

Attenuation Type File Format

Attenuation type filenames must begin with "ATN" and end with ".DAT". The first line in the file is a value that represents the number of sample points in the file. The assumed resolution is 0.1 dB.

Each subsequent line will contain one data value in the assumed units of degrees, with lines separated by a carriage return. The maximum range for the data values is determined by the minimum and maximum Attenuation of the instrument.

A sample data file containing three sample points with a resolution of 0.1 dB is as follows:

3 1.1 1.2 1.7

RF Type File Format

RF type filenames must begin with "RFF" and end with ".DAT". The first line in the file is a value that represents the number of sample points in the file. The assumed resolution is 1 MHz.

Each subsequent line will contain one data value in the assumed units of degrees, with lines separated by a carriage return. The maximum range for the data values is determined by the minimum and maximum RF Input of the instrument.

A sample data file containing three sample points with a resolution of 1 MHz is as follows:

3

1127 1126 1125

Noise Type File Format

Noise type filenames must begin with "WGN" and end with ".DAT". The first line in the file is a value that represents the number of sample points in the file. The assumed resolution is 0.01 dBm.

Each subsequent line will contain one data value in the assumed units of dBm, with lines separated by a carriage return. The maximum range for the data values is determined by the minimum and maximum Noise Density of the instrument.

A sample data file containing three sample points with a resolution of 0.01 dB is as follows:

3 -130.00 -90.25 -90.75

Multipath Type File Format

All of the twelve paths in a multipath channel can be driven dynamically by a single data file. During a dynamic run, the path values for path Doppler, Delay, Loss, and AoA are modified sequentially according to the fading file values.

Multipath type filenames must begin with "MPF" and end with ".DAT". The first line in the file is a value that represents the number of sample points in the file.

The second through thirteenth line in the file represents the path Type, Correlation Path, Correlation Value, Rate, Std Dev, and K-factor settings, which remain fixed during a dynamic run.

Each subsequent line contains Doppler, Loss, Delay and AoA values for each of the 12 paths. Each of these path settings must begin with a semi-colon delimiter ";" and use an ASCII space character to separate the four values. If a path is off, the values between semi-colons are ignored.

The assumed resolution, range and units for each value is as follows:

<u>Type</u>	<u>Units</u>	Resolution	<u>Range</u>
CorrVal	%	1%	0 to 100%
Rate	Hz	1 Hz	0 to 100 Hz
StdDev	dB	1 dB	0 to 12 dB
Kfactor	dB	1 dB	-10 to 20 dB
Doppler	Hz	1 Hz	0 to 10,000Hz
Loss	dBm	0.1 dBm	0.0 to 30.0 dBm

dBm		Advanced Channel Emulator	
Delay	usec	0.001 usec 0.000 to 9.996 usec	

Aoa

degrees

 1 degree
 0.000 to 9.996 us

 1 degree
 0 to 180 degrees

A sample data file containing three sample points with two paths on is as follows:

3 RICE 1 20 0 0 10 OFF RICE 12 30 10 10 20 ;0 0.000 0.0 0;;;;;;;;;;11 0.011 1.1 11; ;12 0.012 1.2 12;;;;;;;;;;;;23 0.023 2.3 23; ;24 0.024 2.4 24;;;;;;;;;;;35 0.035 3.5 35;



Example Code in Python

The following Python example shows the procedure for connecting with the control and data ports, as well as accessing and changing parameter settings:

```
import socket
import os
#----create list of commands
command array = ['Set Mode Static',
'Set Param Ch1 Delay 2.0000000',
'Set Param Ch1 FreqOffset 0.00000',
'Set Param Ch1 Atten 0.0',
'Set Param Ch1 PhaseOffset 0.0',
'Set Param Ch1 RfIn 1125',
'Set Param Ch1 RfOut 1125',
'Set Param Ch1 NoiseEnable On',
'Set Param Ch1 NoiseMode No',
'Set Param Ch1 NoiseNo -100.00',
'Set Param Ch1 NoiseMode EbNo',
'Set Param Ch1 NoiseBr 1.000000',
'Set Param Ch1 NoiseEbNo 0.00',
'Set Param Ch1 NoiseMode No',
'Set Param Ch1 NoiseEnable Off',
'Set Param Ch1 Mpf Path1 Delay 0.000',
'Set Param Ch1 Mpf Path1 Doppler 0',
'Set Param Ch1 Mpf Path1 Loss 0.0',
'Set Param Ch1 Mpf Path1 Aoa 45',
'Set Param Ch1 Mpf Path1 CorrVal 0',
'Set Param Ch1 Mpf Path1 KFactor 0',
'Set Param Ch1 Mpf Path1 Type Rice',
'Set Param Ch1 Mpf Path1 CorrPath Path1',
'Set Param Ch1 Mpf Path1 Rate 0',
'Set Param Ch1 Mpf Path1 StdDev 0',
'Set Param Ch1 Mpf Path2 Type Off',
'Set Param Ch1 Mpf Path3 Type Off',
'Set Param Ch1 Mpf Path4 Type Off',
'Set Param Ch1 Mpf Path5 Type Off',
'Set Param Ch1 Mpf Path6 Type Off',
'Set Param Ch1 Mpf Path7 Type Off',
'Set Param Ch1 Mpf Path8 Type Off',
'Set Param Ch1 Mpf Path9 Type Off',
'Set Param Ch1 Mpf Path10 Type Off',
'Set Param Ch1 Mpf Path11 Type Off',
'Set Param Ch1 Mpf Path12 Type Off',
'Set Mode Dynamic',
'Begin Dynamic Setup',
'Set Dynamic Loop Single',
'Set Dynamic Update Internal',
'Set Dynamic Trigger Internal',
'Set Dynamic StartTime 0',
'Set Dynamic DelayInterval 1',
'Set Dynamic RfInterval 100',
'Set Dynamic MpathInterval 10',
```

```
'Set File Ch1 Delay dly10k.ace',
'Set File Ch1 FreqOffset None',
'Set File Ch1 Atten None',
'Set File Ch1 PhaseOffset None',
'Set File Ch1 RfIn None',
'Set File Ch1 RfOut None',
'Set File Ch1 NoiseNo None',
'Set File Ch1 Mpf None',
'Begin Dynamic Init',
'Start']
#----define port numbers
host = '192.168.1.118'
control portnum = 5555
data_portnum = 5556
buffer size = 1024
#----connect to control and data ports
try:
controlport = socket.socket(socket.AF INET, socket.SOCK STREAM)
controlport.connect((host, control portnum))
print ("Control port opened")
except:
print ("Failed to open control port")
input('Enter key to end ')
exit()
#----send initial hello command
message = 'Hello'
print ("Sending hello command")
controlport.send(message.encode('utf-8'))
data = controlport.recv(buffer size)
print("Received - " + data.decode('utf-8') )
#----send command to open data port
message = 'Open DataPort'
print ("Sending Open DataPort command")
controlport.send(message.encode('utf-8'))
data = controlport.recv(buffer size)
print("Received - " + data.decode('utf-8') )
try:
dataport = socket.socket(socket.AF INET, socket.SOCK STREAM)
dataport.connect((host, data_portnum))
print ("Data port opened")
except:
print ("Failed to open data port")
input('Enter key to end ')
controlport.close()
exit()
print("-----")
print("Check to see if in Dynamic mode after connecting")
\#----get mode and state
message = "Get Mode"
```

dBm

```
print ("Sending get mode command")
controlport.send(message.encode('utf-8'))
data = controlport.recv(buffer size)
print("Received - " + data.decode('utf-8') )
mode = data.decode('utf-8').upper()
message = "Get Dynamic State"
print ("Sending get dynamic state command")
controlport.send(message.encode('utf-8'))
data = controlport.recv(buffer size)
print("Received - " + data.decode('utf-8') )
state = data.decode('utf-8').upper()
testmode = "ACK: MODE DYNAMIC"
teststate = "ACK: DYNAMIC STATE READY"
if testmode in mode:
if teststate in state:
print("In ready state, able to continue")
else:
message = "Reset"
print ("Not in ready state, sending reset command")
controlport.send(message.encode('utf-8'))
data = controlport.recv(buffer size)
print("Received - " + data.decode('utf-8') )
else:
print("In Static mode, able to continue")
print("-----")
print("Starting Profile Setup")
#----send profile setup
for commands in command array:
print ("Sent - " + commands)
controlport.send(commands.encode('utf-8'))
data = controlport.recv(buffer size)
print("Received - " + data.decode('utf-8') )
print("-----")
print("Done with Profile Setup")
#----get state
message = "Get Dynamic State"
print ("Sending get state command")
controlport.send(message.encode('utf-8'))
data = controlport.recv(buffer size)
print("Received - " + data.decode('utf-8') )
print("-----")
#----send close data port
message = "Close DataPort"
print ("Sending Close DataPort command")
controlport.send(message.encode('utf-8'))
data = controlport.recv(buffer_size)
print("Received - " + data.decode('utf-8') )
```

```
print ("Closing data port")
dataport.close()
```

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print ("Closing control port")
controlport.close()

Appendix A: Supplementary Download/Upload Protocol Diagrams

The following are supplementary depictions of the TCP communications sequencing for dynamic data file downloads and uploads.



Figure 31: TCP Communications Sequence for Dynamic Data File Download



Figure 32: TCP Communications Sequence for Dynamic Data File Upload

Appendix B: Text Message Format

Send Message Format								Received Message Format							
Connect a	nd Run C	ommands													
Action	Group	Channel	Parameter	Path	Fading Parameter	<value> or Choice List</value>	Units	Ack/Nak	Group	Channel	Parameter	Path	Fading Parameter	<value> or Choice List</value>	Units
Hello								Ack:	Hello						
Goodbye								Ack:	Goodbye						
Capture		Ch1 to Ch4, All						Ack:	Captured	Ch1 to Ch4					
Calculate								Ack:	Calculated						
Start								Ack:	Dynamic		State			Running, Done, Armed	
Pause								Ack:	Dynamic		State			Paused	
Reset								Ack:	Dynamic		State			Ready	
StepFwd			<setting></setting>				msec	Ack:	Dynamic		ElapsedTime			<setting></setting>	msec
StepBack			<setting></setting>				msec	Ack:	Dynamic		ElapsedTime			<setting></setting>	msec
Open	DataPort							Ack:	DataPort					Opened	
Close	DataPort							Ack:	DataPort					Closed	
Mode Con	nmands														
Set	Mode					Static, Dynamic		Ack:	Mode					Static, Dynamic	
Get	Mode							Ack:	Mode					Static, Dynamic	
Set	Delay Sl	ew Boundary				<setting></setting>	msec	Ack:	Delay Slew	Boundary				<setting></setting>	msec
Get	Delay Sl	ew Boundary					msec	Ack:	Delay Slew	Boundary				<setting></setting>	msec
Storing an	nd Recall	Commands													
Recall	Settings					0 to 9		Ack:	Settings					0 to 9	
Store	Settings					0 to 8		Ack:	Settings					0 to 8	
Factory S	etting Cor	mmands													
Get	Version		SwVersion					Ack:	Version		SwVersion			<string></string>	
Get	Version		SerialNumber					Ack:	Version		SerialNumber			<string></string>	
Get	Version		ModelNumber					Ack:	Version		ModelNumber	·		<string></string>	



Get	Options	Ch1 to Ch4	FadingLicense				Ack:	Options	Ch1 to Ch4	FadingLicense	Enabled, Disabled	
Get	Options	Ch1 to Ch4	AwgnLicense				Ack:	Options	Ch1 to Ch4	AwgnLicense	Enabled, Disabled	
Get	Options	Ch1 to Ch4	RfSlave				Ack:	Options	Ch1 to Ch4	RfSlave	Enabled, Disabled	
Get	Options	Ch1 to Ch4	Installed				Ack:	Options	Ch1 to Ch4	Installed	Enabled, Disabled	
Set	Options	Ch1 to Ch4	Multipath		Enable/Disable		Ack:	Options	Ch1 to Ch4	Multipath	Enabled, Disabled	
Get	Options	Ch1 to Ch4	Multipath				Ack:	Options	Ch1 to Ch4	Multipath	Enabled, Disabled	
Set	Options	Ch1 to Ch4	CapturePoint		Before, After		Ack:	Options	Ch1 to Ch4	CapturePoint	Before, After	
Get	Options	Ch1 to Ch4	CapturePoint				Ack:	Options	Ch1 to Ch4	CapturePoint	Before, After	
Dynamic	Related Co	mmands										
Set	Dynamic		Trigger		Internal, External		Ack:	Dynamic		Trigger	Internal, External	
Set	Dynamic		Loop		Single, Continuous, FwdRev		Ack:	Dynamic		Loop	Single, Continuous	
Set	Dynamic		MultiChassisS	ync	StandAlone, Master, Slave		Ack:	Dynamic		MultiChassisSync	StandAlone, Master, Slave	
Set	Dynamic		Update		Internal, External		Ack:	Dynamic		Update	Internal, External	
Set	Dynamic		DelayInterval		1,2,5,10,20,50,100,200,500, 1000	msec	Ack:	Dynamic		DelayInterval	1,2,5,10,20,50,100,200,500, 1000	msec
Set	Dynamic		RfInterval		100,200,500,1000	msec	Ack:	Dynamic		RfInterval	100,200,500,1000	msec
Set	Dynamic		MpathInterval		100,200,500,1000	msec	Ack:	Dynamic		MpathInterval	100,200,500,1000	msec
Set	Dynamic		StartTime		<setting></setting>	msec	Ack:	Dynamic		StartTime	<setting></setting>	msec
Get	Dynamic		Trigger				Ack:	Dynamic		Trigger	Internal, External	
Get	Dynamic		Loop				Ack:	Dynamic		Loop	Single, Continuous, FwdRev	
Get	Dynamic		MultiChassisS	ync			Ack:	Dynamic		MultiChassisSync	StandAlone, Master, Slave	
Get	Dynamic		Update				Ack:	Dynamic		Update	Internal, External	
Get	Dynamic		DelayInterval				Ack:	Dynamic		DelayInterval	1,2,5,10,20,50,100,200,500, 1000	msec
Get	Dynamic		RfInterval				Ack:	Dynamic		RfInterval	100,200,500,1000	msec
Get	Dynamic		MpathInterval				Ack:	Dynamic		MpathInterval	100,200,500,1000	msec



Get	Dynamic		StartTime		Ack:	Dynamic		StartTime	<setting> msec</setting>
Get	Dynamic		ElapsedTime		Ack:	Dynamic		ElapsedTime	<pre><setting> msec</setting></pre>
Get	Dynamic		State		Ack:	Dynamic		State	Static, Ready, Init, Setup, Running, Paused, Done, Armed
Begin	Dynamic		Setup		Ack:	Dynamic S	State Setup;	· · · · ·	
Begin	Dynamic		Init		Ack:	Dynamic S	State Ready;		
File Relate	ed Comma	nds							
Get	File		Count		Ack:	File		Count	<number></number>
Delete	File			<filename></filename>	Ack:	File			<pre><filename> Deleted</filename></pre>
Get	File		SizeInBytes	<filename></filename>	Ack:	File Sizeln	Bytes <filenar< td=""><td>ne><size></size></td><td></td></filenar<>	ne> <size></size>	
Get	File		Info	<filename></filename>	Ack:	File Info <f< td=""><td>filename> <typ< td=""><td>oe> <length> <continu< td=""><td>ous> <timestamp></timestamp></td></continu<></length></td></typ<></td></f<>	filename> <typ< td=""><td>oe> <length> <continu< td=""><td>ous> <timestamp></timestamp></td></continu<></length></td></typ<>	oe> <length> <continu< td=""><td>ous> <timestamp></timestamp></td></continu<></length>	ous> <timestamp></timestamp>
Set	File	Ch1 to Ch4	Delay	<filename></filename>	Ack:	File	Ch1 to Ch4	Delay	<filename></filename>
Set	File	Ch1 to Ch4	FreqOffset	<filename></filename>	Ack:	File	Ch1 to Ch4	FreqOffset	<filename></filename>
Set	File	Ch1 to Ch4	Atten	<filename></filename>	Ack:	File	Ch1 to Ch4	Atten	<filename></filename>
Set	File	Ch1 to Ch4	PhaseOffset	<filename></filename>	Ack:	File	Ch1 to Ch4	PhaseOffset	<filename></filename>
Set	File	Ch1 to Ch4	Rfln	<filename></filename>	Ack:	File	Ch1 to Ch4	Rfln	<filename></filename>
Set	File	Ch1 to Ch4	RfOut	<filename></filename>	Ack:	File	Ch1 to Ch4	RfOut	<filename></filename>
Set	File	Ch1 to Ch4	NoiseNo	<filename></filename>	Ack:	File	Ch1 to Ch4	NoiseNo	<filename></filename>
Set	File	Ch1 to Ch4	Mpf	<pre></pre> <pre></pre>	Ack:	File	Ch1 to Ch4	Mpf	<filename></filename>
Get	File	Ch1 to Ch4	Delay		Ack:	File	Ch1 to Ch4	Delay	<filename></filename>



Get	File	Ch1 to Ch4	FreqOffset			Ack:	File	Ch1 to Ch4 Free	qOffset	<filename></filename>	
Get	File	Ch1 to Ch4	Atten			Ack:	File	Ch1 to Ch4 Atte	en	<filename></filename>	
Get	File	Ch1 to Ch4	PhaseOffset			Ack:	File	Ch1 to Ch4 Pha	aseOffset	<pre></pre>	
Get	File	Ch1 to Ch4	Rfln			Ack:	File	Ch1 to Ch4 RfIn	n	<pre></pre>	
Get	File	Ch1 to Ch4	RfOut			Ack:	File	Ch1 to Ch4 RfO	Dut	<pre></pre>	
Get	File	Ch1 to Ch4	NoiseNo			Ack:	File	Ch1 to Ch4 Nois	seNo	<pre></pre>	
Get	File	Ch1 to Ch4	Mpf			Ack:	File	Ch1 to Ch4 Mpf	f	<pre></pre>	
Channel P	arameter	Related Cor	nmands								
Set	Param	Ch1 to Ch4	Delay	<setting></setting>	msec	Ack:	Param	Ch1 to Ch4 Dela	ay	<setting></setting>	msec
Set	Param	Ch1 to Ch4	FreqOffset	<pre><setting></setting></pre>	kHz	Ack:	Param	Ch1 to Ch4 Free	qOffset	<pre><setting></setting></pre>	kHz
Set	Param	Ch1 to Ch4	Atten	<pre><setting></setting></pre>	dB	Ack:	Param	Ch1 to Ch4 Atte	en	<setting></setting>	dB
Set	Param	Ch1 to Ch4	PhaseOffset	<pre><setting></setting></pre>	degrees	Ack:	Param	Ch1 to Ch4 Pha	aseOffset	<pre><setting></setting></pre>	deg
Set	Param	Ch1 to Ch4	Rfln	<pre><setting></setting></pre>	MHz	Ack:	Param	Ch1 to Ch4 RfIn	n	<pre><setting></setting></pre>	MHz
Set	Param	Ch1 to Ch4	RfOut	<pre><setting></setting></pre>	MHz	Ack:	Param	Ch1 to Ch4 RfO	Dut	<setting></setting>	MHz
Set	Param	Ch1 to Ch4	NoiseNo	<pre><setting></setting></pre>	dBm	Ack:	Param	Ch1 to Ch4 Nois	iseNo	<setting></setting>	dBm
Set	Param	Ch1 to Ch4	NoiseBR	<pre><setting></setting></pre>	MHz	Ack:	Param	Ch1 to Ch4 Nois	iseBR	<pre><setting></setting></pre>	MHz



Set	Param	Ch1 to Ch4	NoiseEbNo			<setting></setting>	dB	Ack:	Param	Ch1 to Ch4	NoiseEbNo			<setting></setting>	dB
Set	Param	Ch1 to Ch4	NoiseMode			No, EbNo		Ack:	Param	Ch1 to Ch4	NoiseMode			No, EbNo	
Set	Param	Ch1 to Ch4	NoiseEnable			On, Off		Ack:	Param	Ch1 to Ch4	NoiseEnable			On, Off	
Set	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Delay	<setting></setting>	usec	Ack:	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Delay	<setting></setting>	usec
Set	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Doppler	<setting></setting>	Hz	Ack:	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Doppler	<setting></setting>	Hz
Set	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Loss	<setting></setting>	dB	Ack:	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Loss	<setting></setting>	dB
Set	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Туре	Off, Cw, Ray, Rice		Ack:	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Туре	Off, Cw, Ray, Rice	
Set	Param	Ch1 to Ch4	Mpf	Path1 to Path12	CorrPath	Path1 to Path12		Ack:	Param	Ch1 to Ch4	Mpf	Path1 to Path12	CorrPath	Path1 to Path12	
Set	Param	Ch1 to Ch4	Mpf	Path1 to Path12	CorrVal	<setting></setting>	%	Ack:	Param	Ch1 to Ch4	Mpf	Path1 to Path12	CorrVal	<setting></setting>	%
Set	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Kfactor	<setting></setting>	dB	Ack:	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Kfactor	<setting></setting>	dB
Set	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Ratio	<setting></setting>	Hz	Ack:	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Ratio	<setting></setting>	Hz
Set	Param	Ch1 to Ch4	Mpf	Path1 to Path12	StdDev	<setting></setting>	dB	Ack:	Param	Ch1 to Ch4	Mpf	Path1 to Path12	StdDev	<setting></setting>	dB
Set	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Aoa	<setting></setting>	degrees	Ack:	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Aoa	<setting></setting>	deg



Get	Param	Ch1 to Ch4	Delay			Ack:	Param	Ch1 to Ch4	Delay			<setting></setting>	msec
Get	Param	Ch1 to Ch4	FreqOffset			Ack:	Param	Ch1 to Ch4	FreqOffset			<setting></setting>	kHz
Get	Param	Ch1 to Ch4	Atten			Ack:	Param	Ch1 to Ch4	Atten			<setting></setting>	dB
Get	Param	Ch1 to Ch4	PhaseOffset			Ack:	Param	Ch1 to Ch4	PhaseOffset			<setting></setting>	deg
Get	Param	Ch1 to Ch4	RfIn			Ack:	Param	Ch1 to Ch4	RfIn			<setting></setting>	MHz
Get	Param	Ch1 to Ch4	RfOut			Ack:	Param	Ch1 to Ch4	RfOut			<setting></setting>	MHz
Get	Param	Ch1 to Ch4	NoiseNo			Ack:	Param	Ch1 to Ch4	NoiseNo			<setting></setting>	dBm
Get	Param	Ch1 to Ch4	NoiseBR			Ack:	Param	Ch1 to Ch4	NoiseBR			<setting></setting>	MHz
Get	Param	Ch1 to Ch4	NoiseEbNo			Ack:	Param	Ch1 to Ch4	NoiseEbNo			<setting></setting>	dB
Get	Param	Ch1 to Ch4	NoiseMode			Ack:	Param	Ch1 to Ch4	NoiseMode			No, EbNo	
Get	Param	Ch1 to Ch4	NoiseEnable			Ack:	Param	Ch1 to Ch4	NoiseEnable			On, Off	
Get	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Delay	 Ack:	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Delay	<setting></setting>	usec
Get	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Doppler	Ack:	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Doppler	<setting></setting>	Hz
Get	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Loss	Ack:	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Loss	<setting></setting>	dB

Get	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Туре		Ack:	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Туре	Off, Cw, Ray, Rice	
Get	Param	Ch1 to Ch4	Mpf	Path1 to Path12	CorrPath		Ack:	Param	Ch1 to Ch4	Mpf	Path1 to Path12	CorrPath	Path1 to Path12	
Get	Param	Ch1 to Ch4	Mpf	Path1 to Path12	CorrVal		Ack:	Param	Ch1 to Ch4	Mpf	Path1 to Path12	CorrVal	<setting></setting>	%
Get	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Kfactor		Ack:	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Kfactor	<setting></setting>	dB
Get	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Ratio		Ack:	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Ratio	<setting></setting>	Hz
Get	Param	Ch1 to Ch4	Mpf	Path1 to Path12	StdDev		Ack:	Param	Ch1 to Ch4	Mpf	Path1 to Path12	StdDev	<setting></setting>	dB
Get	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Aoa		Ack:	Param	Ch1 to Ch4	Mpf	Path1 to Path12	Aoa	<setting></setting>	deg
Get	Param	Ch1 to Ch4	SigPower				Ack:	Param	Ch1 to Ch4	SigPower			<setting> InRange, Overflow</setting>	dBm
Get	Param	Ch1 to Ch4	CalcStatus				Ack:	Param	Ch1 to Ch4	CalcStatus			Calculated, NotCalculated	
Get	Param	Ch1 to Ch4	RangeStatus				Ack:	Param	Ch1 to Ch4	RangeStatus			InRange, OutOfRange	
Download	ling a Bina	ary Dynamic	Data File											
Begin	File		Transfer			<filename> <size></size></filename>	Ack:	File		Transfer			Beginning	
Binary							Ack:	File		Transfer			Next	
End	File		Transfer			<filename></filename>	Ack:	File		Transfer			Ending	
Abort	File		Transfer			<filename></filename>	Ack:	File		Transfer			Aborted	
Uploading	a Binary	Dynamic Da	ta File											
Begin	File		UpTransfer			<filename></filename>	Ack:	File		Transfer			Beginning	

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Next	File		UpTransfer	<filename></filename>	Nak: or	Binary				
End	File		UpTransfer	<filename></filename>	Ack:	File	Transfer		Ending	
Abort	File		UpTransfer	<filename></filename>	Ack:	File	Transfer		Aborted	
Uploading	g a Capture	d Data fron	n Channel							
Begin	Capture		UpTransfer	Ch1 to Ch4	Ack:	Capture	UpTransfer		Beginning	
Next	Capture		UpTransfer		Nak: or	Binary				
End	Capture		UpTransfer	Ch1 to Ch4	Ack:	Capture	UpTransfer		Ending	
Abort	Capture		UpTransfer	Ch1 to Ch4	Ack:	Capture	UpTransfer		Aborted	
Uploading	g Dynamic	File Directo	ry List							
Begin	File		Dirltem		Nak: or	File	Dirltem		Next	
End	File		Directory		Ack:	File	Directory		Ending	
Next	File		Dirltem		Nak: or	File	Dirltem		Filename	